
The BOG
Willow Lake, Plumas County http://creagrus.home.montereybay.com/CA-PLU-WillowLake.html

Goals for Today

- Update the Review Panel on developments over the past year
- Group discussion of second draft Clean Lakes Report
- Update on upgrade of Safe to Eat Portal
- Group discussion of 2016 Sampling Plan
- Discussion of long-term sampling plan
- Make sure we hear from the Panel
  - Format for each item: Presentation, Panel, general discussion

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Item 2: Update on BOG and SWAMP

- Wildlife Study (2012-13)
  - Completed last summer
  - Fact sheet and press release in December
- “Clean Lakes” Study (2014)
  - All data are in
  - Revised draft discussed today
- Bass Lake Monitoring (2015)
  - Successful sampling campaign

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Item 2: Updates

- SWAMP
  - SWAMP Strategic Review
  - Newsletter
  - SWAMP Symposium in June
- Monitoring Council

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Approved Multi-Year Workplan

		Actual				Planning			
	Fiscal Year	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
	Sampling Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
		Clean Lakes	**Bass Lakes 1**	**Lake Info Gaps**	**Bass Lakes 2**		**Bass Lakes 3**	**Coast**	**Bass Lakes 4**
Management, Coordination	Project management and coordination, peer review: SWAMP and CWQMC (SFEI)	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
	Project management and coordination, monitoring design, data validation, infrastructure: SWAMP (MPSL)	$76,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000
Sport Fish	Clean Lakes Study	$263,457							
	Status and Trend Monitoring (Lakes, Coast, Rivers)		$280,000	$360,000	$360,000	$360,000	$460,000	$460,000	$360,000
	Coastal Fish (Round 2)								
	Statewide Synthesis Report (SWAMP + Other)					$100,000			$100,000
Portal	Upload, Maintenance, Minor Enhancements	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
	UIUX Survey and Add Functionality								
	Upgrade Code: Open Source Base Map			$30,000					
Cyanotoxins	Cyanotoxin White Paper	$50,000							
	Cyanotoxin Tissue Monitoring								
	Cyanobacteria		$150,000	$100,000	$100,000				
Wildlife	?? - opportunistic partnering?								
CECs	Anticipate this being covered by others								
Miscellaneous	SQO	$7,500							
	TOTAL	$511,957	$620,000	$680,000	$650,000	$650,000	$650,000	$650,000	$650,000

Item 3: Second Draft Report on the Clean Lakes Study

- Presentation and discussion today
- Written comments due 4/29
- Desired outcomes:
  - Facilitate review
  - Input to guide completion of the report

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What's New

1. Revised assessment approach
2. Region 7 Study data included
3. The "Why" data: prey fish, water, sediment

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Subcommittee on Communicating SWAMP Data to the Public

1. Discussed in September meeting
2. Subcommittee met in January
3. Agreed on criteria
   - Simple, easy to understand
   - Convey the right message (not be misleading)
   - Consistent with existing or future OEHHA consumption advice

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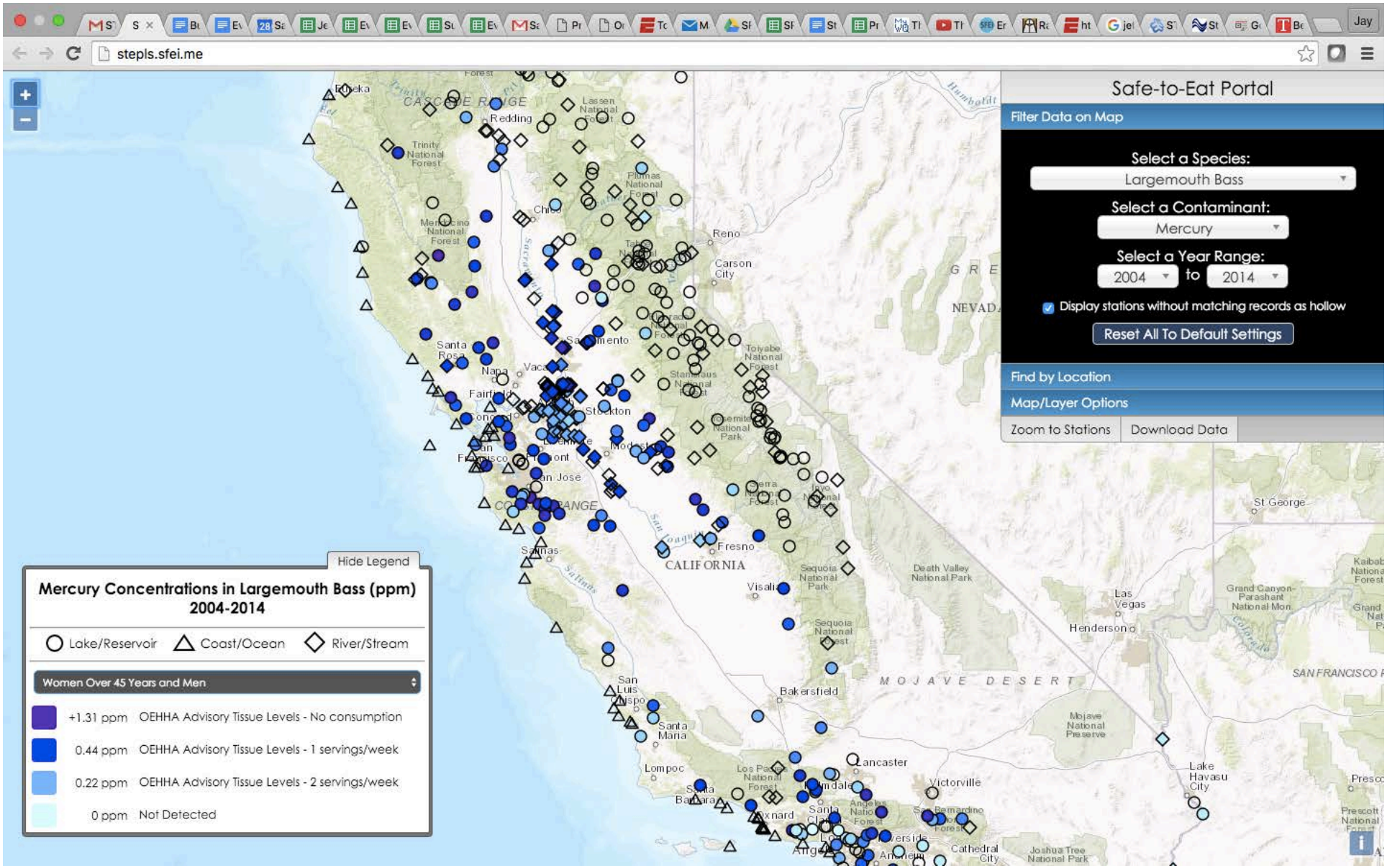
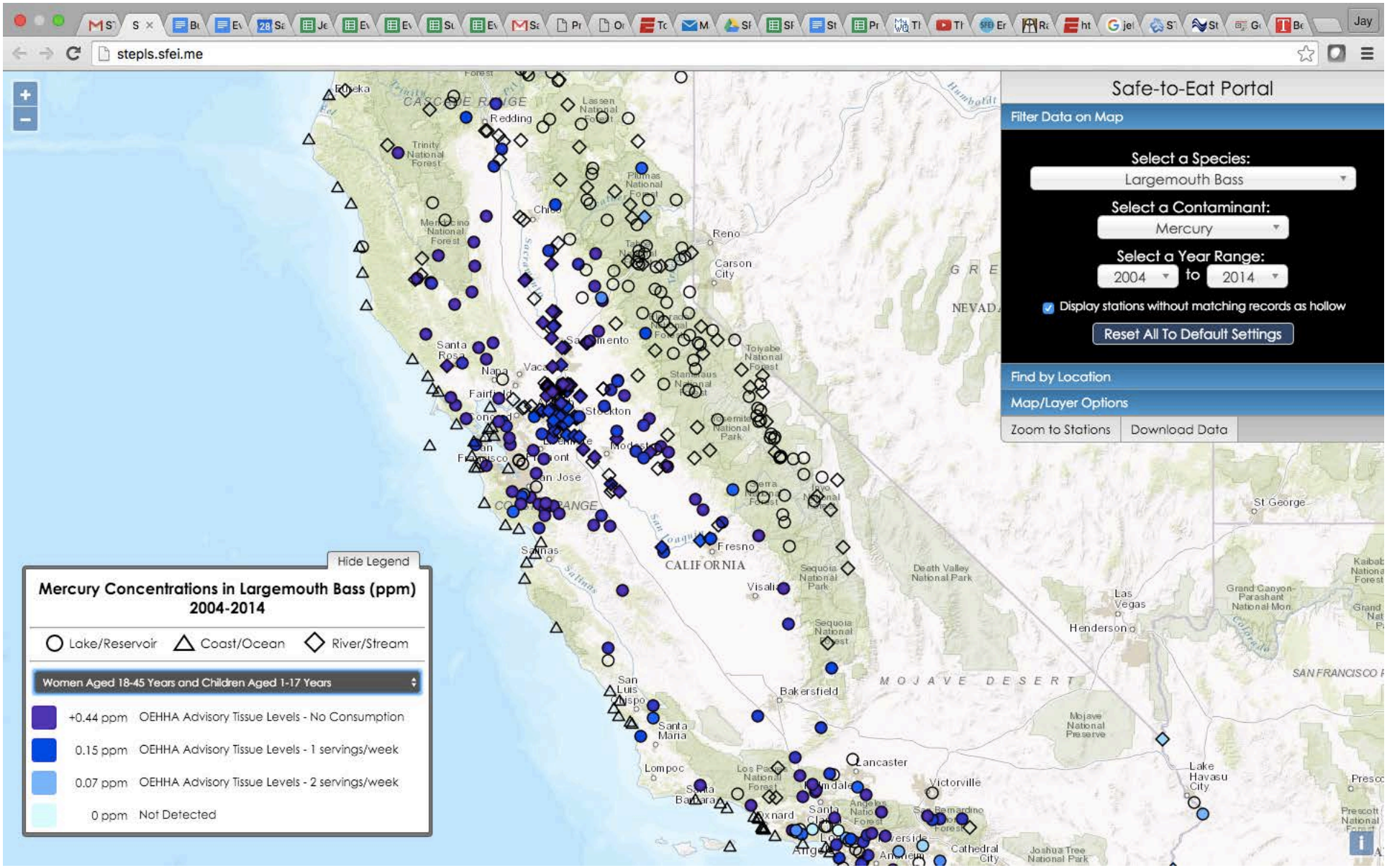
Revised Portal Opening Map – Less-sensitive Population



Still a work in progress…

Revised Portal Opening Map – Sensitive Population



Still a work in progress…

Purpose of the Technical Report

- Document and allow peer review of the technical foundation for the other communication products for these studies
  - The Portal
  - Fact sheet(s)
  - Press release

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Discussion/Review Points

1. Was the study and the analysis technically sound?
2. Did we answer the management questions?
3. What important information gaps remain?

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Clean(est) Lakes Study: Background

- Smaller-scale study – a lower funding year – $260K for sampling and analysis
  - Narrow scope for analytes

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Management Questions

1. (Primary) Which popular lakes in California can be confirmed to have relatively low concentrations of contaminants in sport fish?
2. (Secondary) Why do some lakes have relatively low concentrations of methylmercury in sport fish?
3. (Secondary) Did the 2007-8 survey accurately characterize the status of lakes in which only rainbow trout were collected?

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Management Questions

1. (Primary) Which popular lakes in California can be confirmed to have relatively low concentrations of contaminants in sport fish?
    - Definition of “confirmed”
        - Repeated observation across years
        - A primary mercury indicator species and a primary organics indicator species in both rounds
        - Focus on bass lakes

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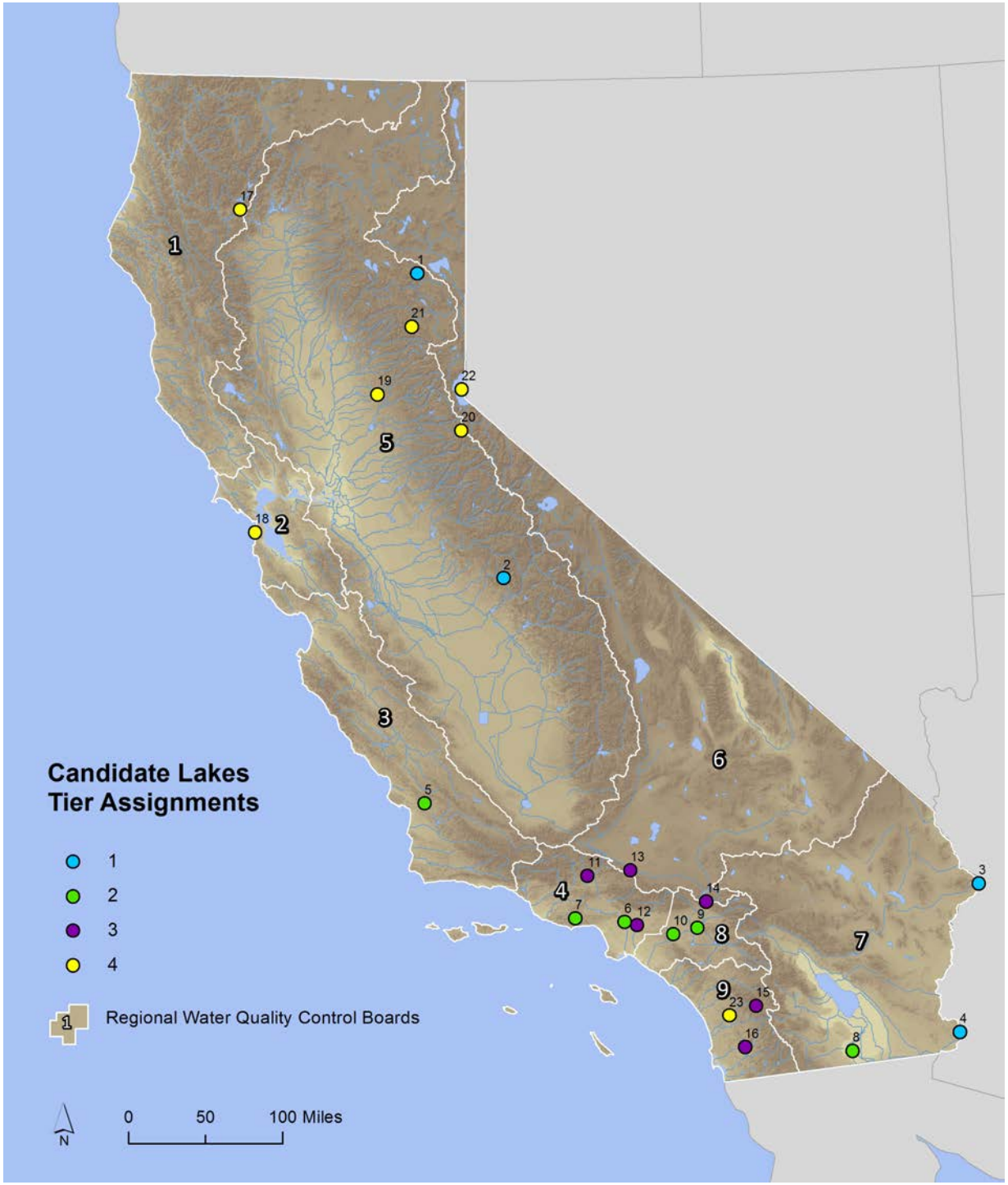
Table 3. Criteria for assigning candidate lakes to tiers. Colors refer to shading in Table 4.

Tier 1 (blue)
Both indicator types sampled
Hg: Below 303(d) listing criterion (90% of samples below 0.2 ppm)
Organics: Below 303(d) listing criteria (90% of samples below FCGs)
At least some fishing activity

Tier 2 (green)
Both indicator types sampled
Hg: Below 303(d) listing criterion (90% of samples below 0.2 ppm)
Organics: means in the ATL range for three servings per week
At least some fishing activity

Tier 3 (purple)
Both indicator types sampled
Hg: mean below 0.2
Organics: means in the ATL range for three servings per week
At least some fishing activity

Tier 4 (yellow)
Both indicator types not sampled
Hg: Below 303(d) listing criterion (90% of samples below 0.2 ppm)
Organics: Below 303(d) listing criteria (90% of samples below FCGs)
The more fishing the better


Candidate Lakes
Tier Assignments
1
2
3
4
Regional Water Quality Control Boards
0
50
100 Miles
N

Coordination and Partners

- $169K of additional work
- Region 4
- Region 7
- USGS-WI
- USGS-Corvallis
- USGS-Menlo Park

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Catch Summary: Clean Lakes

Species Name	Common Name	Number of Fish	Compo-sites - Number of Samples	Compo-sites - Number of Locations	Individ-uals - Number of Samples	Individ-uals - Number of Locations	Total Number of Locations Sampled	Min Length (mm)	Median Length (mm)	Max Length (mm)	Analyzed as Compo-sites	Analyzed as Individ-uals
Ameiurus catus	White Catfish	6	1	1	1	1	2	441	612	686	x	x
Ameiurus nebulosus	Brown Bullhead	26	6	4	2	1	5	171	334	396	x	x
Cyprinus carpio	Common Carp	46	10	7			7	390	580	790	x	
Hysterocarpus traskii	Tule Perch	10	2	1			1	106	119	136	x	
Ictalurus furcatus	Blue Catfish	6	2	1			1	385	433	470	x	
Ictalurus punctatus	Channel Catfish	58	13	8	1	1	9	215	471	700	x	x
Lepomis cyanellus	Green Sunfish	15	2	2			2	101	131	186	x	
Lepomis gibbosus	Pumpkinseed	17	2	2			2	110	126	156	x	
Lepomis macrochirus	Bluegill	106	16	11	2	1	12	109	154	243	x	x
Lepomis microlophus	Redear Sunfish	40	7	4			4	110	217	298	x	
Micropterus salmoides	Largemouth Bass	209	3	2	209	19	19	200	348	570	x	x
Morone saxatilis	Striped Bass	37	5	2	32	2	2	315	374	694	x	x
Oncorhynchus mykiss	Rainbow Trout	41	3	2	41	8	8	209	306	450	x	x
Oncorhynchus mykiss gairdneri	Steelhead Rainbow Trout	4	1	1	4	1	1	487	519	543	x	x
Oncorhynchus nerka	Kokanee	2	1	1			1	472	491	510	x	
Oncorhynchus tshawytscha	Chinook Salmon	5	1	1			1	238	274	308	x	
Pomoxis	Crappie	20	4	2			2	166	247	365	x	
Pomoxis annularis	White Crappie	19	4	2	9	1	2	122	148	168	x	x
Pomoxis nigromaculatus	Black Crappie	18	4	2			2	155	213	305	x	
Pylodictis olivaris	Flathead Catfish	5	2	1			1	205	270	930	x	
Salmo trutta	Brown Trout	14	1	1	14	3	3	231	268	295	x	x
Salvelinus namaycush	Lake Trout	1			1	1	1	300	300	300		x
	Total Number of Fish	705										
	Total Number of Species	22										

Analytical: 6,105 results, only 32 rejected

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Catch Summary: Region 7

Species Name	Common Name	Number of Fish	Composites - Number of Samples	Composites - Number of Locations	Individuals - Number of Samples	Individuals - Number of Locations	Total Number of Locations Sampled	Min Length (mm)	Median Length (mm)	Max Length (mm)	Analyzed as Composites	Analyzed as Individuals
Ameiurus nebulosus	Brown Bullhead	5	1	1			1	245	290	310	x	
Cyprinus carpio	Common Carp	61	15	11	35	8	12	288	553	724	x	x
Ictalurus punctatus	Channel Catfish	62	18	6	32	3	6	270	580	836	x	
Lepomis macrochirus	Bluegill	53	10	7			7	122	157	207	x	
Lepomis microlophus	Redear Sunfish	56	11	7			7	131	225	382	x	
Micropterus salmoides	Largemouth Bass	129	12	8	129	10	10	205	367	647	x	x
Morone saxatilis	Striped Bass	63	4	4	62	4	4	200	464	656	x	x
Pomoxis nigromaculatus	Black Crappie	15	4	2			2	195	264	332	x	
Pylodictis olivaris	Flathead Catfish	20	4	4	15	5	6	424	558	760	x	x
Tilapia	Tilapia spp.	39	7	6	39	7	7	161	248	390	x	x
	Number of Fish	503										
	Number of Species	10										

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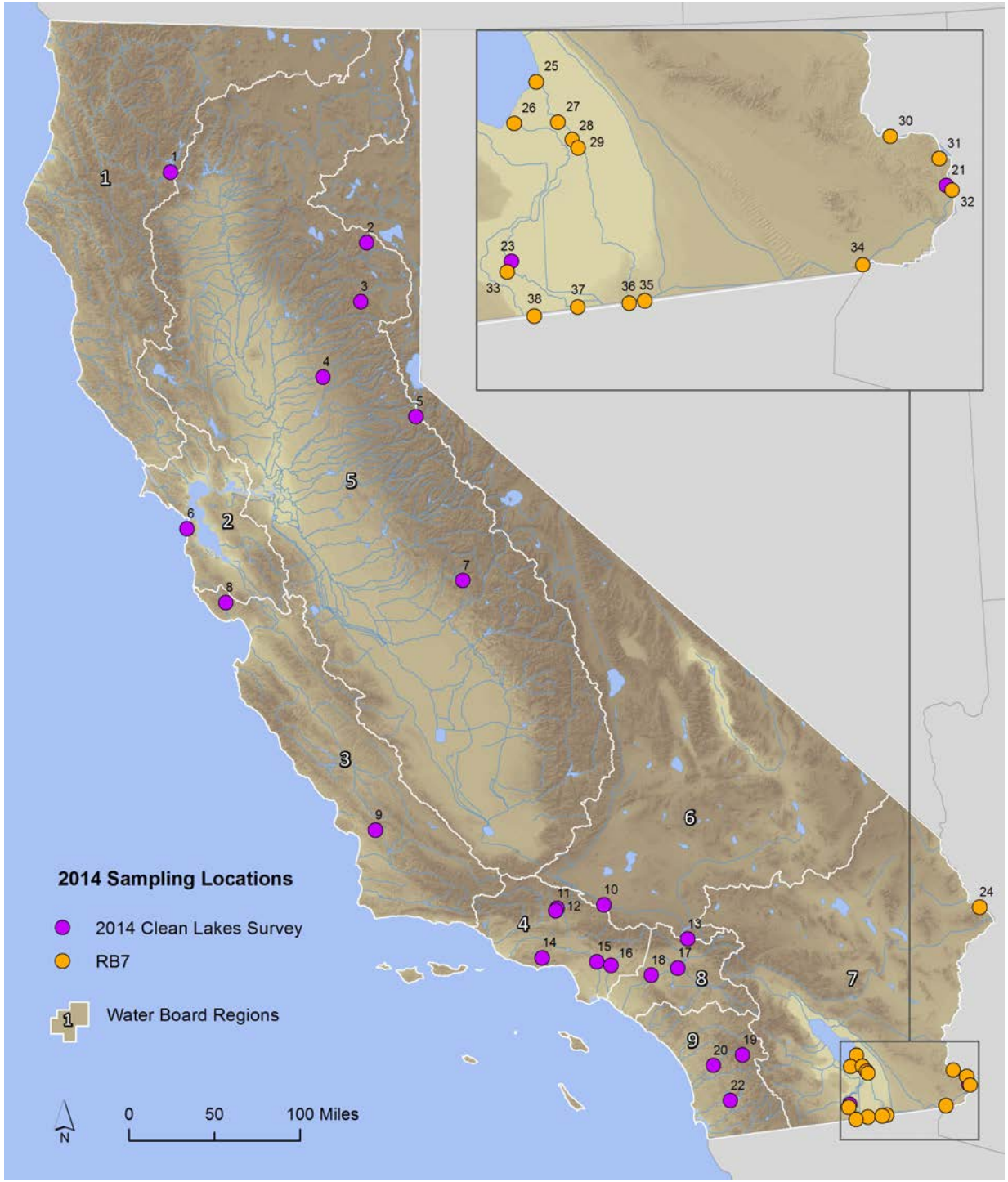
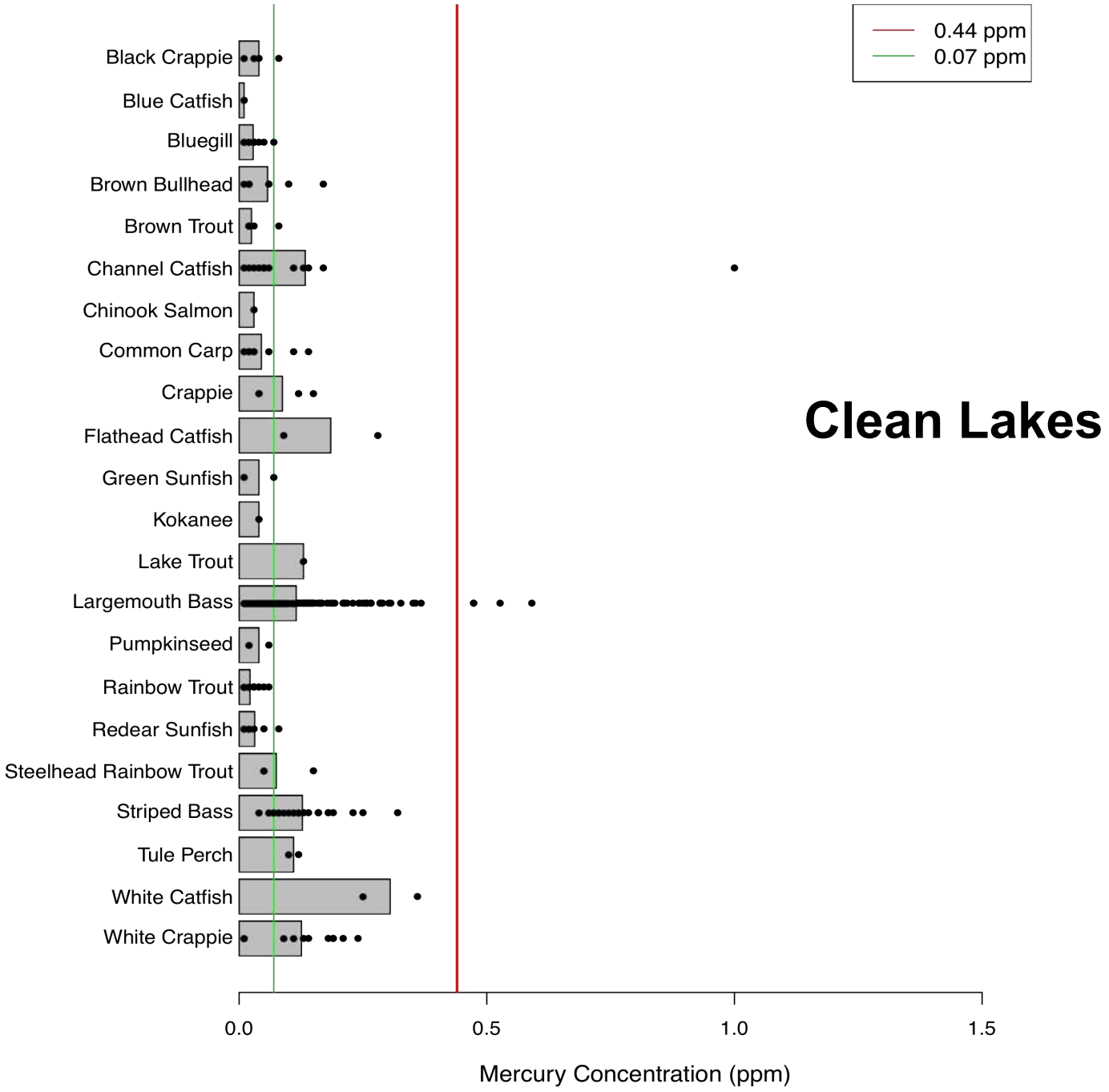
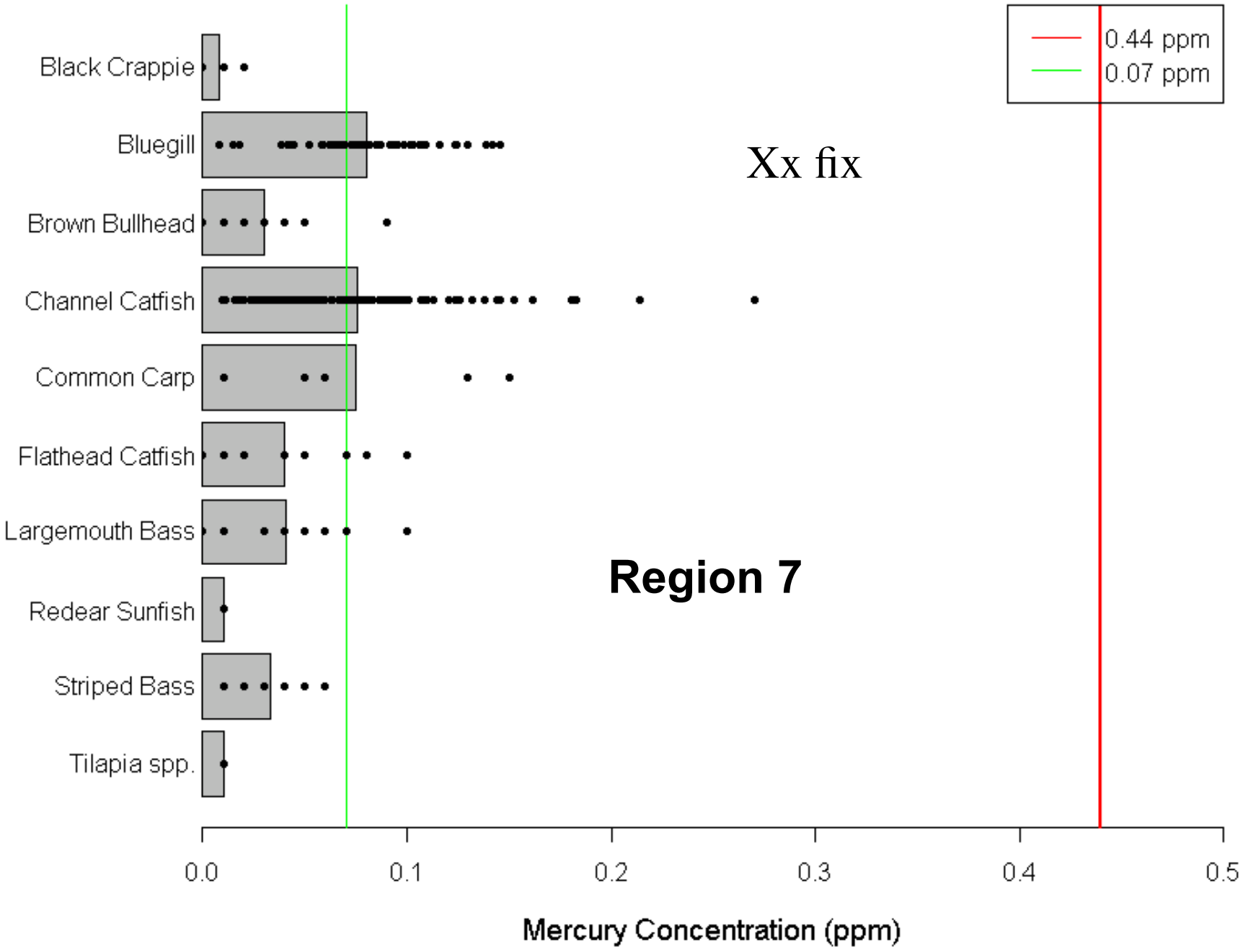
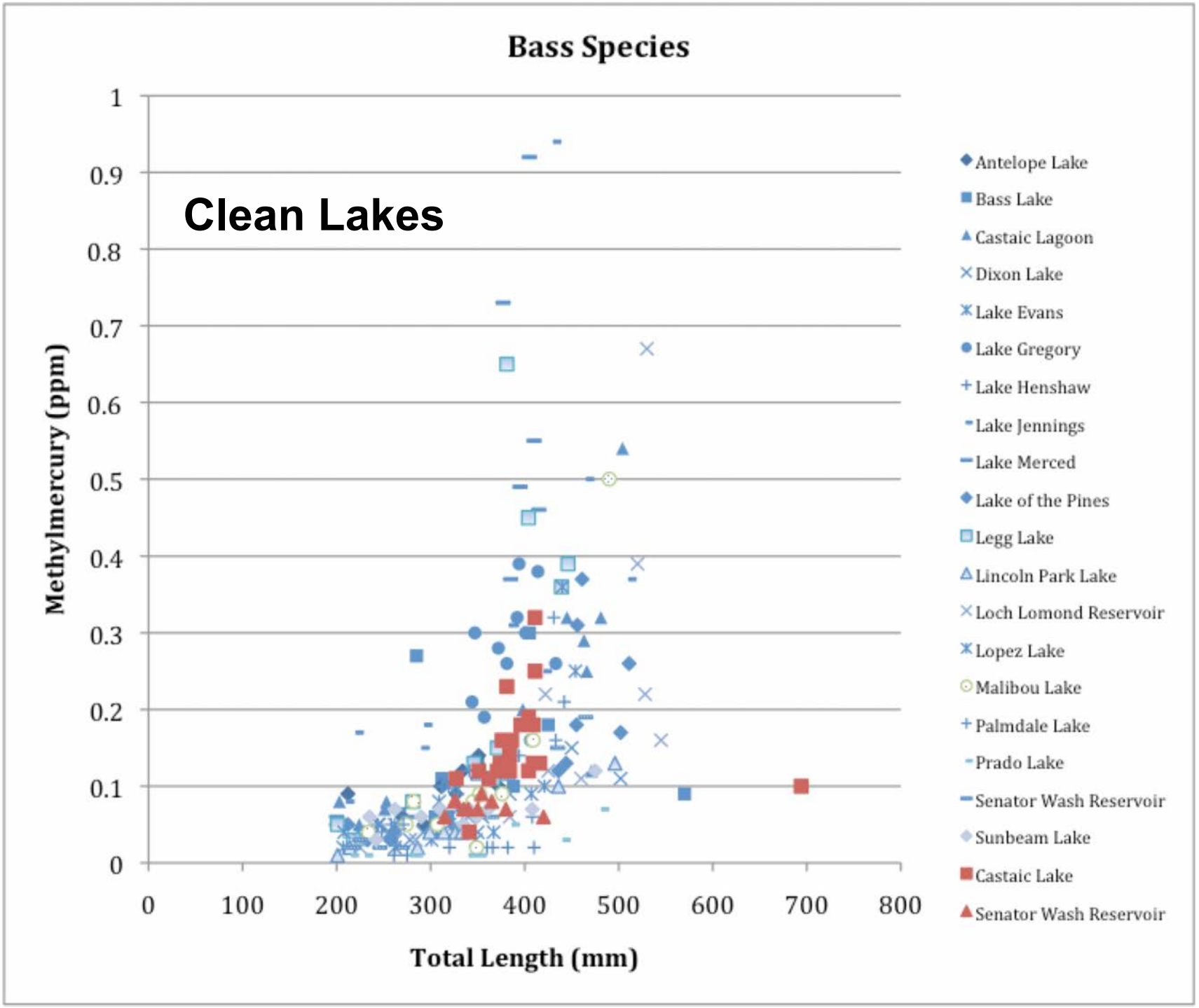
Lakes Sampled

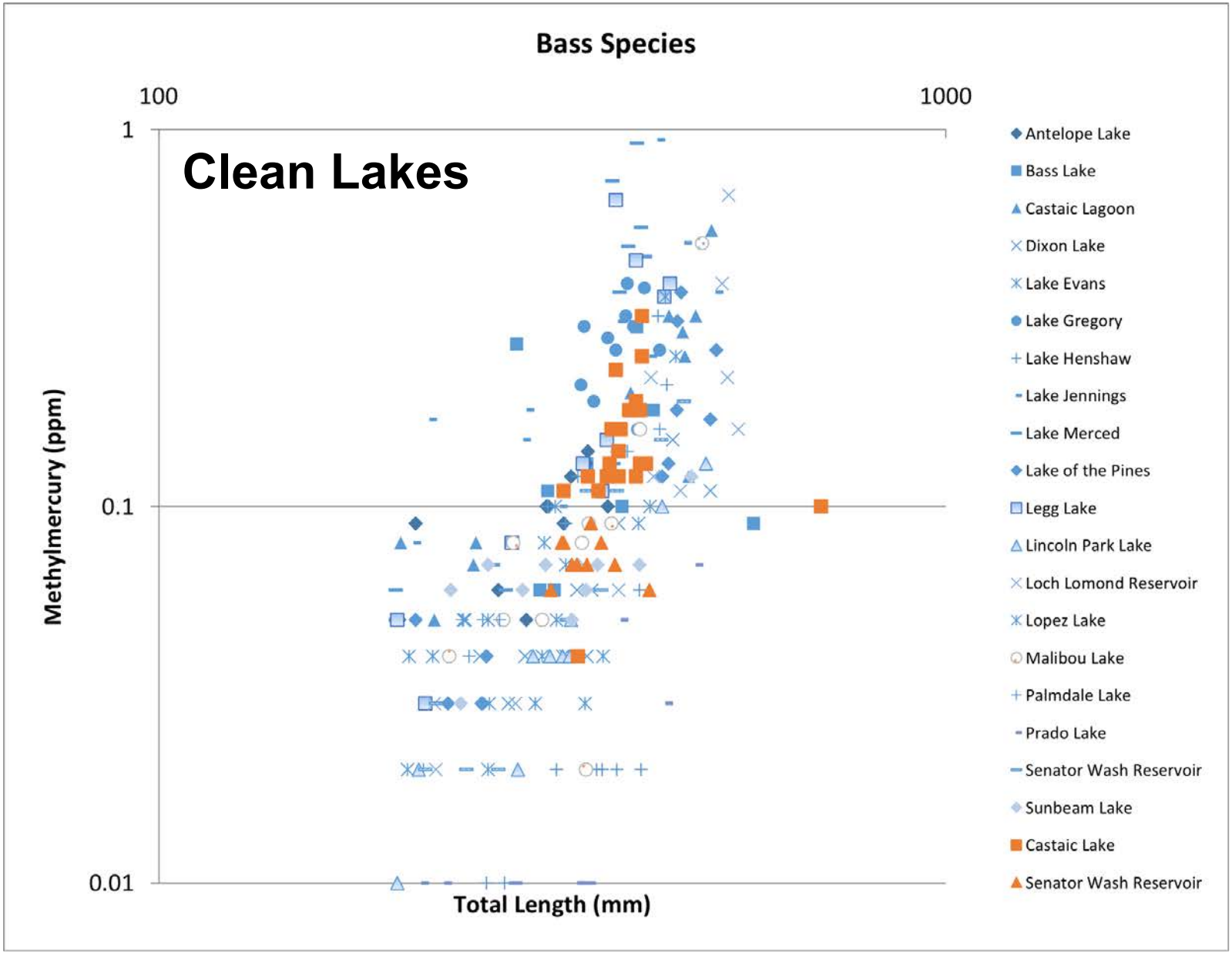
- Clean Lakes Study – 23 lakes
- Region 7 Study – 6 lakes (8 river sites)

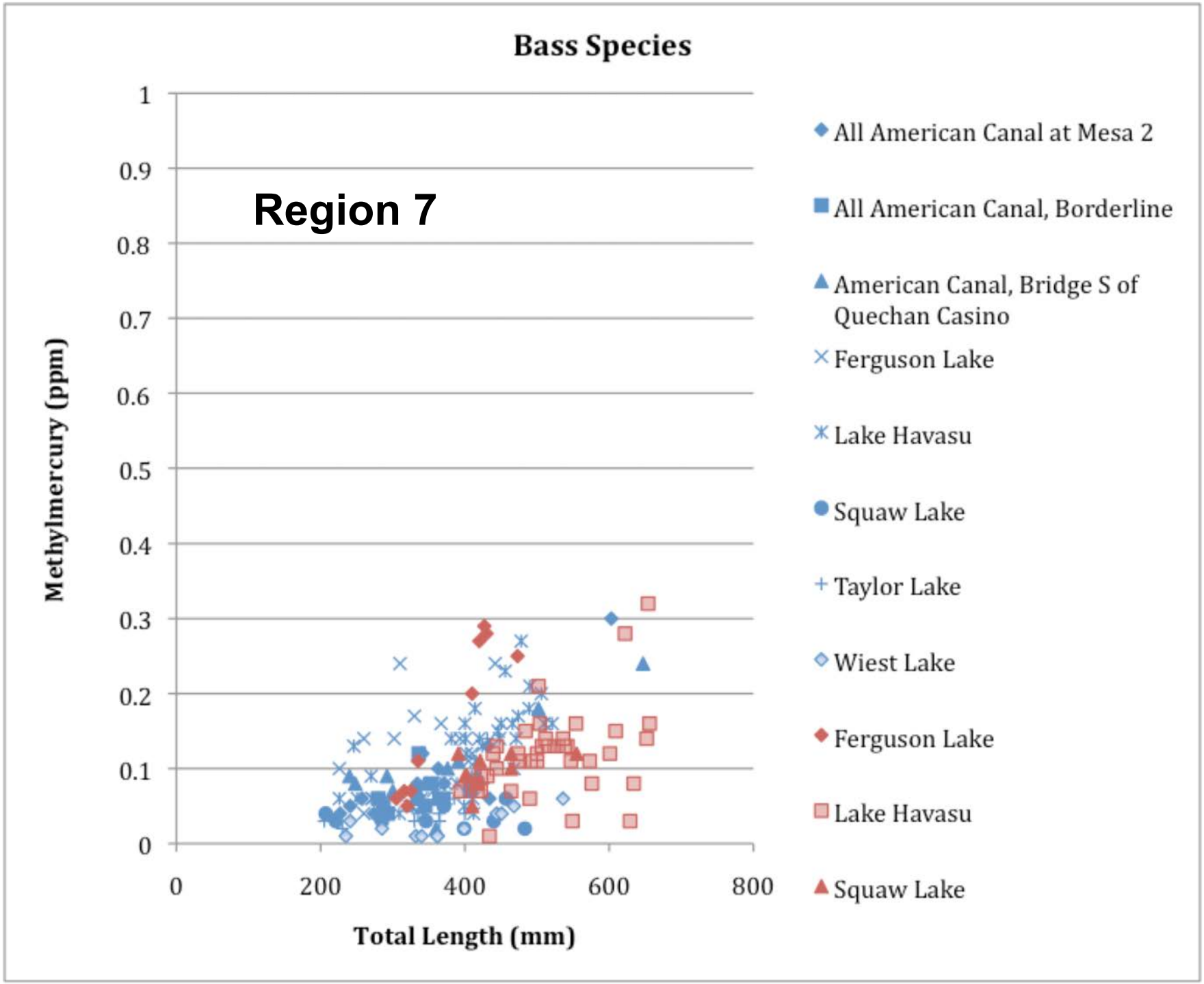


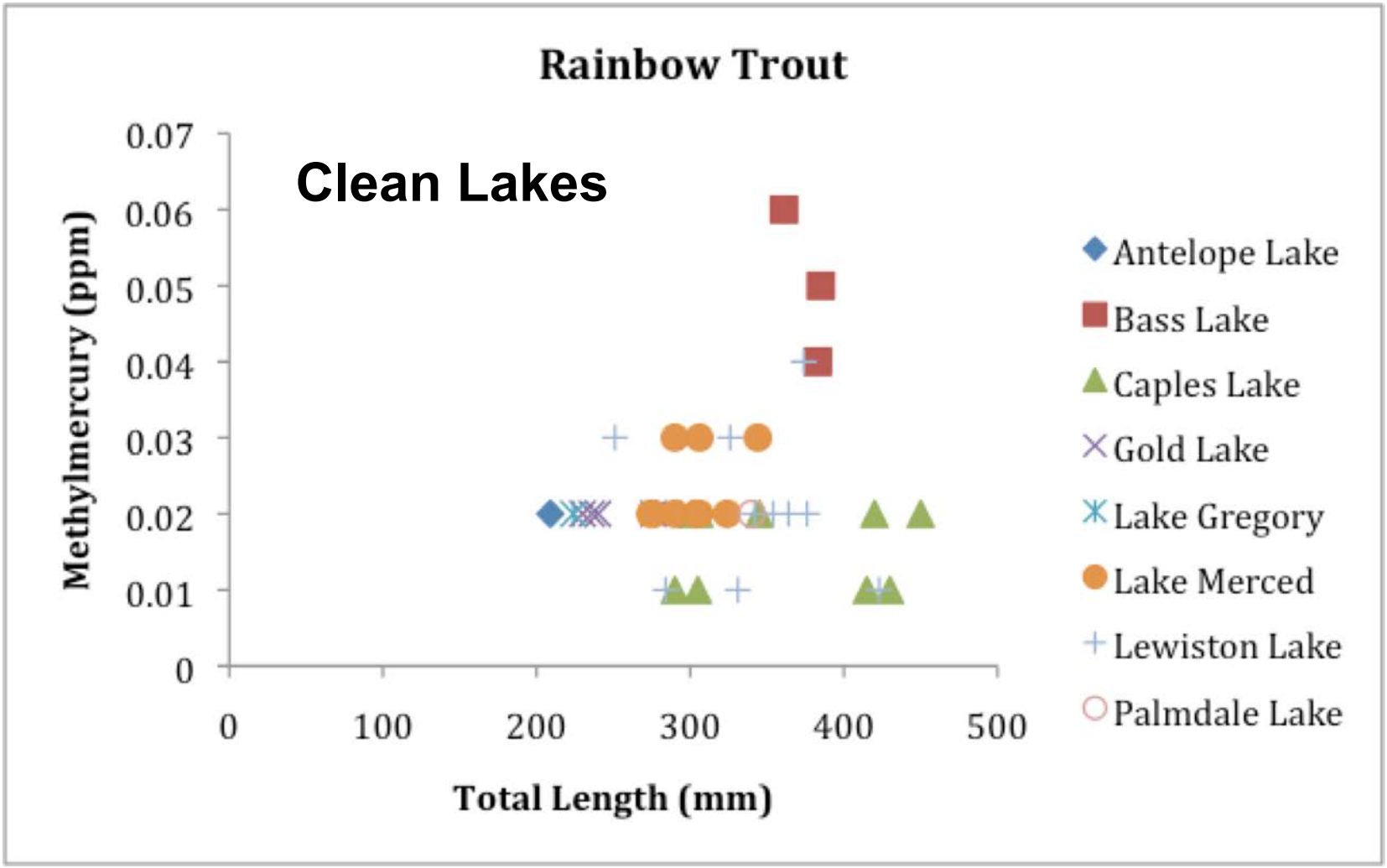

0.44 ppm
0.07 ppm
Clean Lakes
Black Crappie
Blue Catfish
Bluegill
Brown Bullhead
Brown Trout
Channel Catfish
Chinook Salmon
Common Carp
Crappie
Flathead Catfish
Green Sunfish
Kokanee
Lake Trout
Largemouth Bass
Pumpkinseed
Rainbow Trout
Redear Sunfish
Steelhead Rainbow Trout
Striped Bass
Tule Perch
White Catfish
White Crappie
0.0
0.5
1.0
1.5
Mercury Concentration (ppm)


0.44 ppm
0.07 ppm
Black Crappie
Bluegill
Brown Bullhead
Channel Catfish
Common Carp
Flathead Catfish
Largemouth Bass
Redear Sunfish
Striped Bass
Tilapia spp.
Xx fix
Region 7
0.0
0.1
0.2
0.3
0.4
0.5
Mercury Concentration (ppm)


Bass Species
Clean Lakes
Methylmercury (ppm)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
100
200
300
400
500
600
700
800
Total Length (mm)
Antelope Lake
Bass Lake
Castaic Lagoon
Dixon Lake
Lake Evans
Lake Gregory
Lake Henshaw
Lake Jennings
Lake Merced
Lake of the Pines
Legg Lake
Lincoln Park Lake
Loch Lomond Reservoir
Lopez Lake
Malibou Lake
Palmdale Lake
Prado Lake
Senator Wash Reservoir
Sunbeam Lake
Castaic Lake
Senator Wash Reservoir

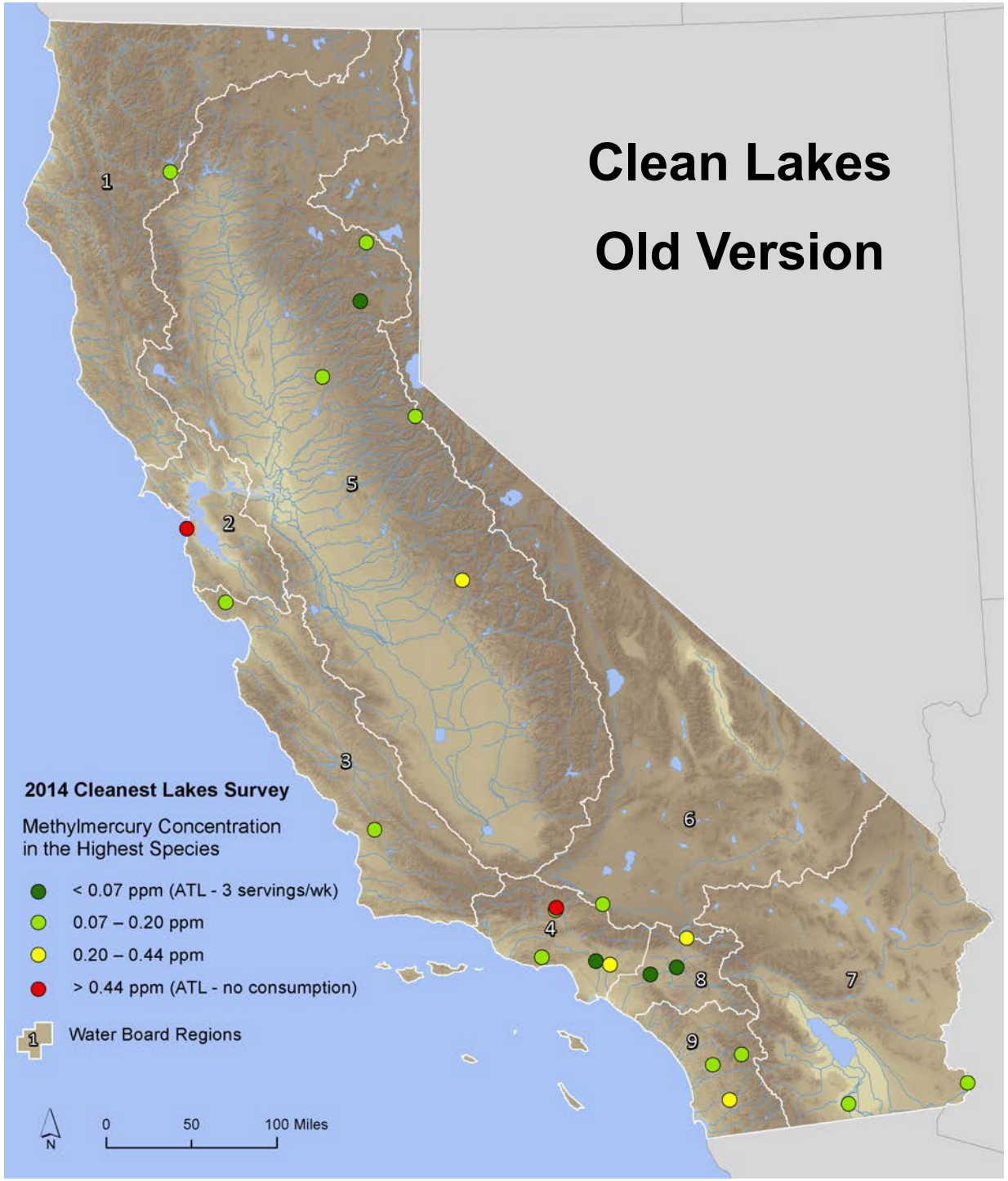

Bass Species
Clean Lakes
100
1000
1
0.1
0.01
Methylmercury (ppm)
Total Length (mm)
Antelope Lake
Bass Lake
Castaic Lagoon
Dixon Lake
Lake Evans
Lake Gregory
Lake Henshaw
Lake Jennings
Lake Merced
Lake of the Pines
Legg Lake
Lincoln Park Lake
Loch Lomond Reservoir
Lopez Lake
Malibou Lake
Palmdale Lake
Prado Lake
Senator Wash Reservoir
Sunbeam Lake
Castaic Lake
Senator Wash Reservoir

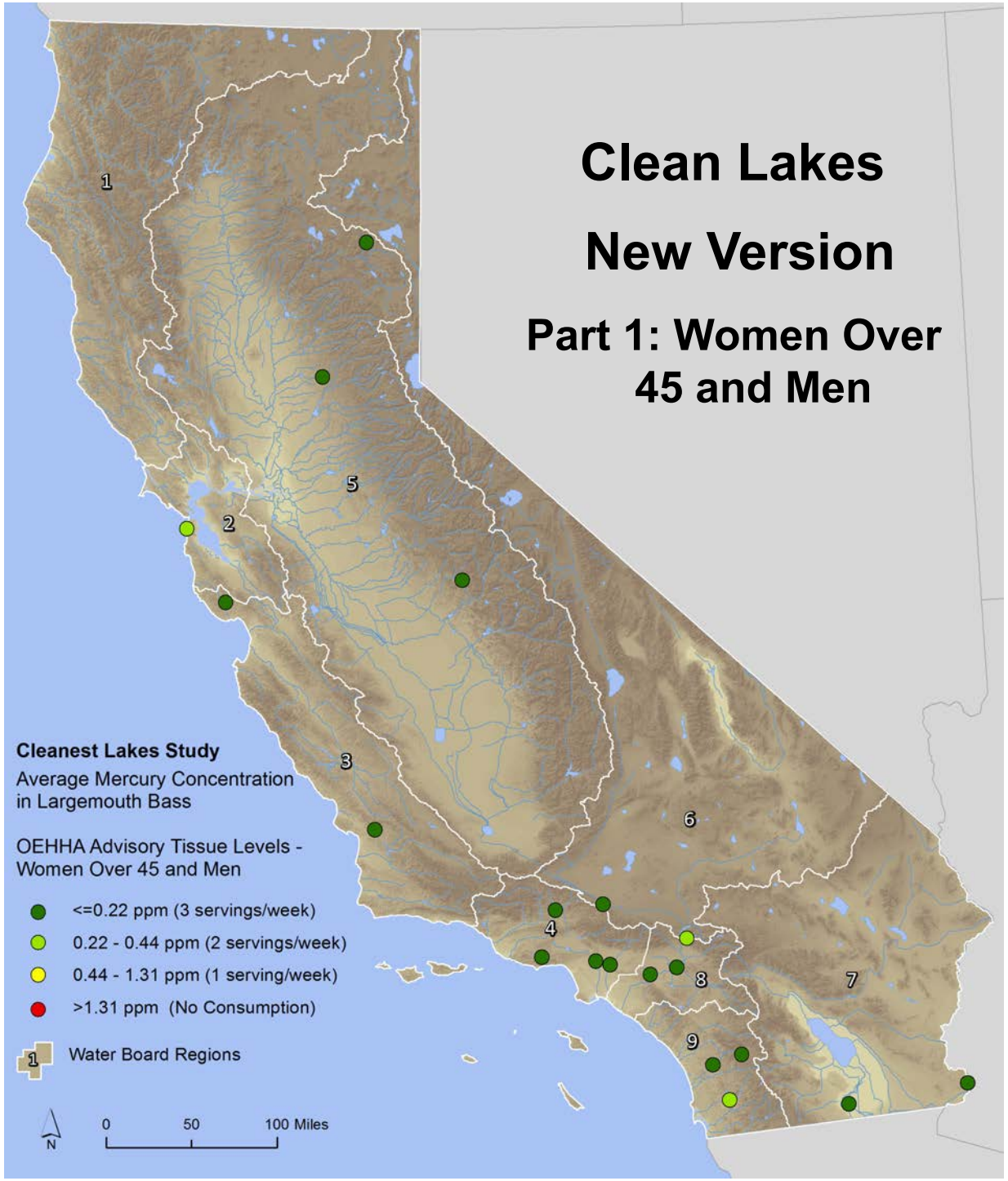

Bass Species
Region 7
Methylmercury (ppm)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
200
400
600
800
Total Length (mm)
All American Canal at Mesa 2
All American Canal, Borderline
American Canal, Bridge S of Quechan Casino
Ferguson Lake
Lake Havasu
Squaw Lake
Taylor Lake
Wiest Lake
Ferguson Lake
Lake Havasu
Squaw Lake


Rainbow Trout
Clean Lakes
Methylmercury (ppm)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
100
200
300
400
500
Total Length (mm)
Antelope Lake
Bass Lake
Caples Lake
Gold Lake
Lake Gregory
Lake Merced
Lewiston Lake
Palmdale Lake

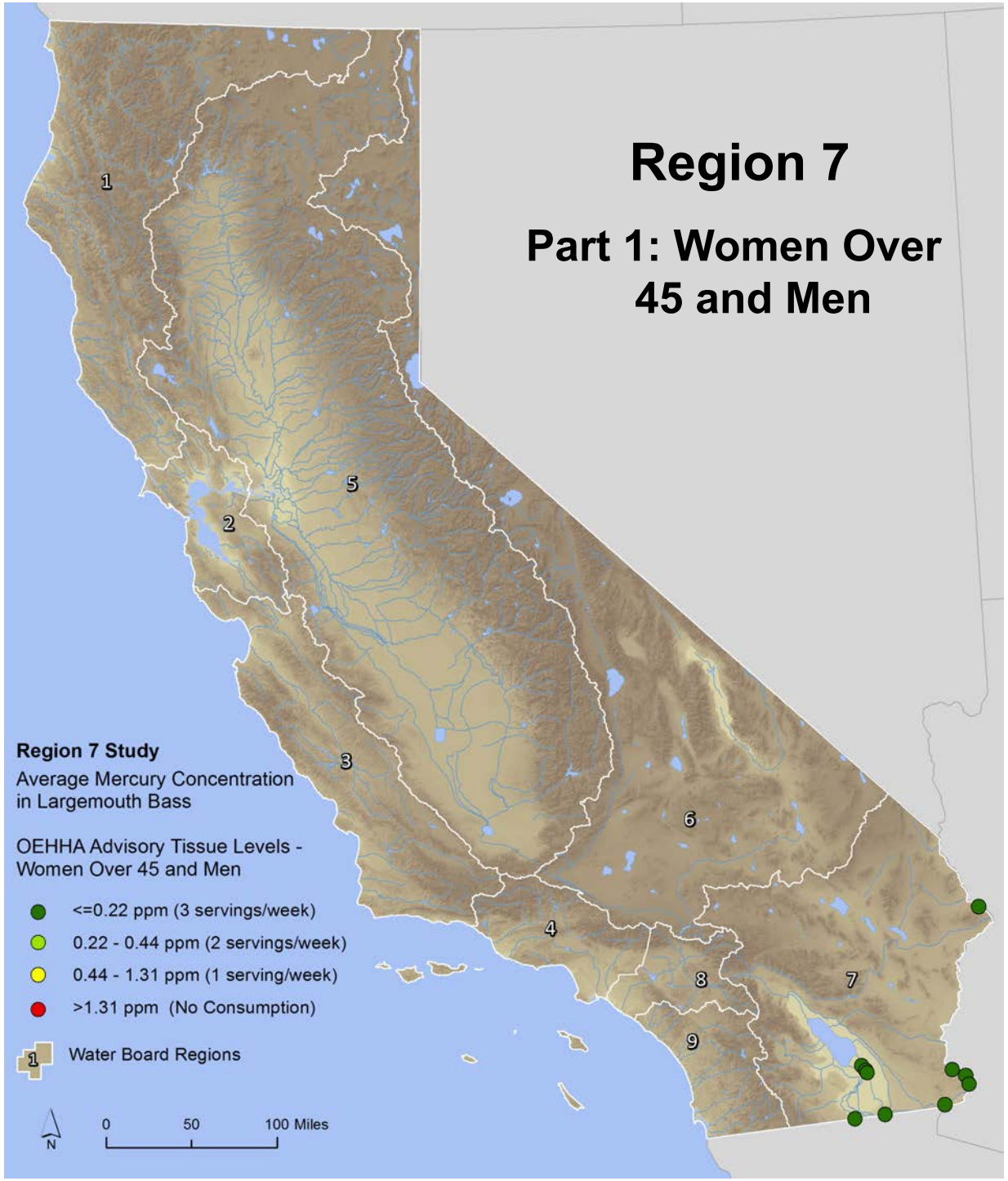
Clean Lakes

Old Version




Clean Lakes
New Version
Part 1: Women Over 45 and Men
Cleanest Lakes Study
Average Mercury Concentration in Largemouth Bass
OEHHA Advisory Tissue Levels - Women Over 45 and Men
<=0.22 ppm (3 servings/week)
0.22 - 0.44 ppm (2 servings/week)
0.44 - 1.31 ppm (1 serving/week)
>1.31 ppm (No Consumption)
Water Board Regions
N
0
50
100 Miles
1
2
3
4
5
6
7
8
9


Clean Lakes
New Version
Part 2: Women 18-45 and Children 1-17
Cleanest Lakes Study
Average Mercury Concentration in Largemouth Bass
OEHHA Advisory Tissue Levels - Women 18-45 and Children 1-17
<=0.07 ppm (3 servings/week)
0.07 - 0.15 ppm (2 servings/week)
0.15 - 0.44 ppm (1 serving/week)
>0.44 ppm (No Consumption)
Water Board Regions
N
0
50
100 Miles
1
2
3
4
5
6
7
8
9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>1.31 ppm (No Consumption)
Water Board Regions
N
0
50
100 Miles
1
2
3
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6
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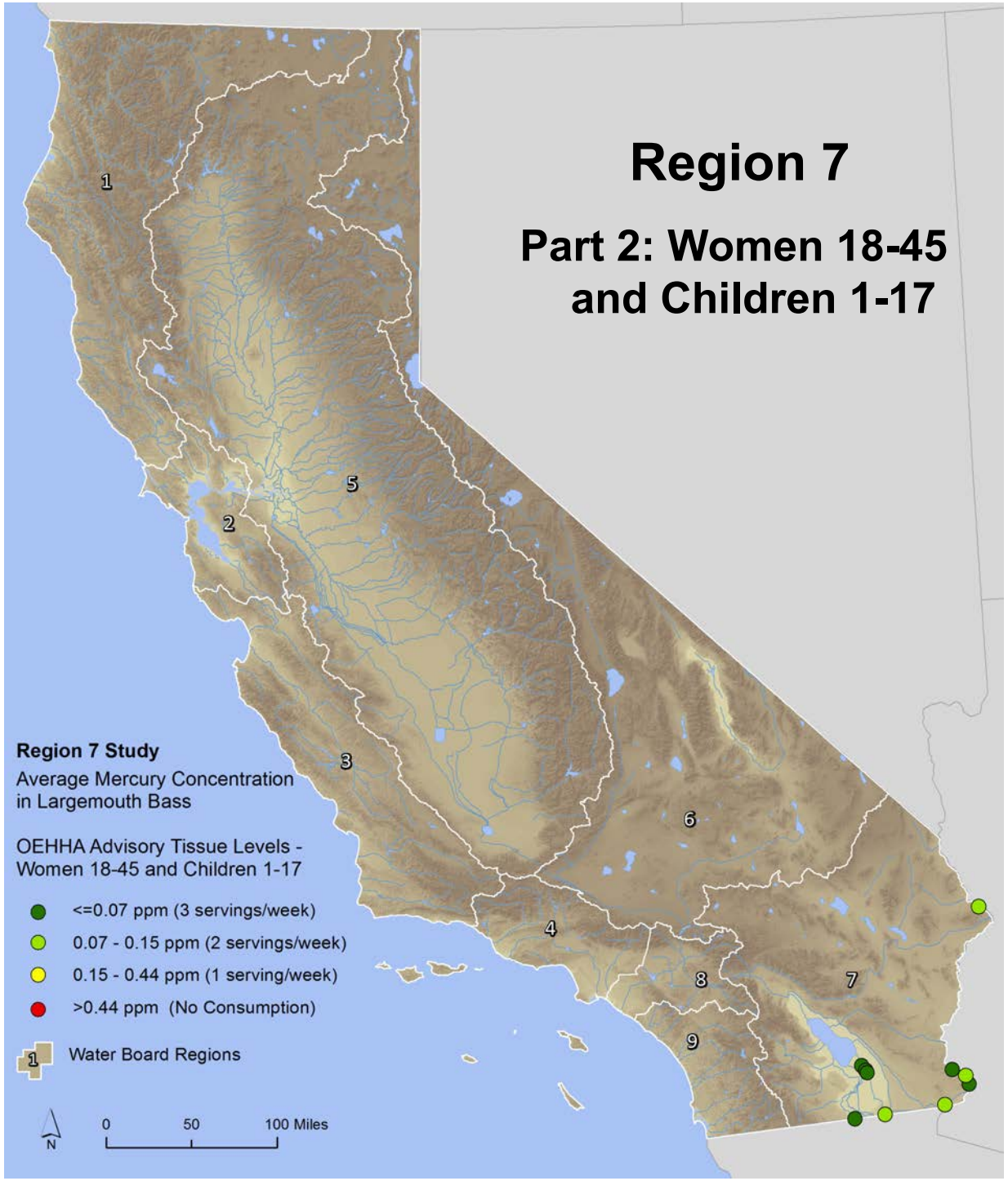
8
9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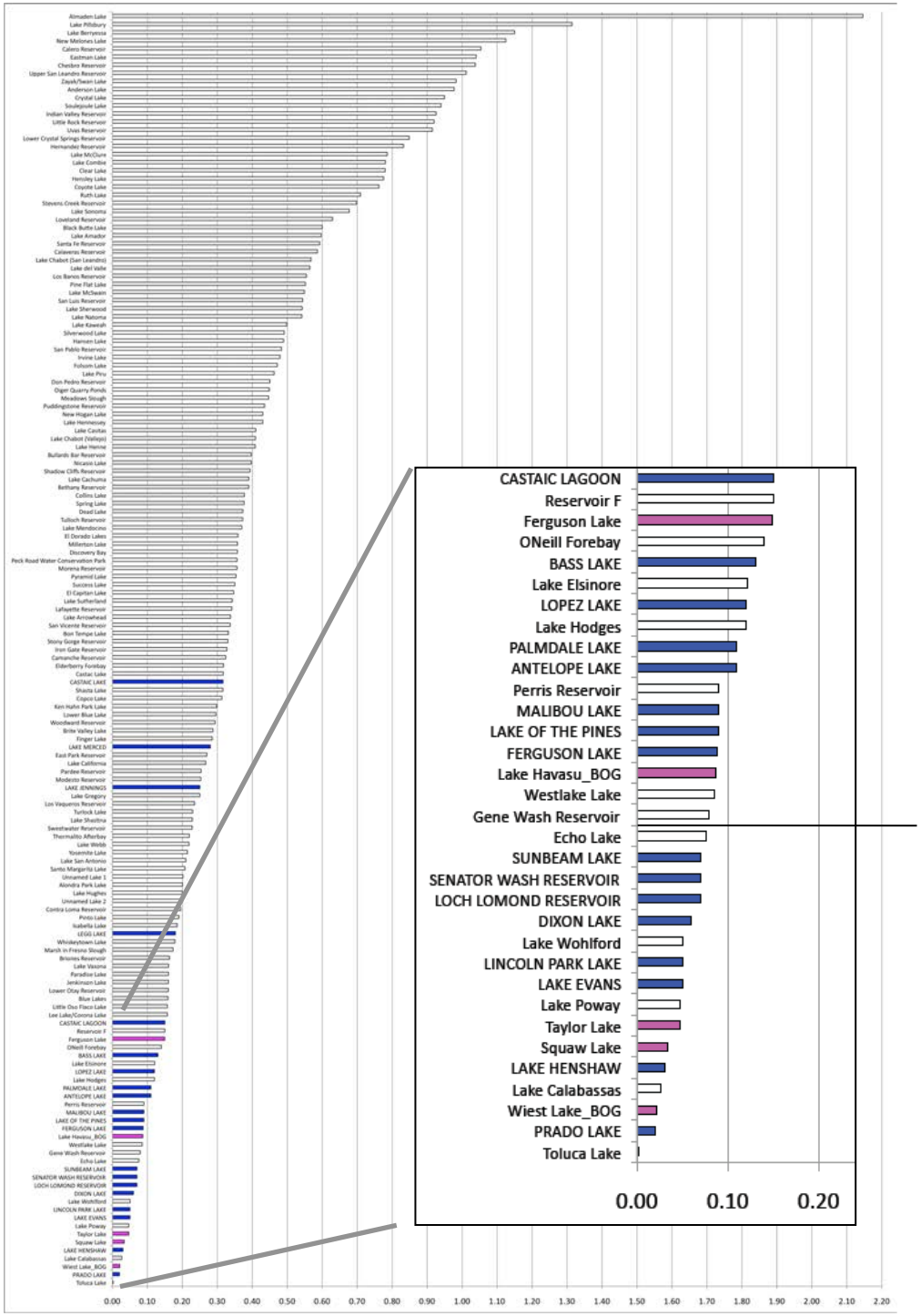
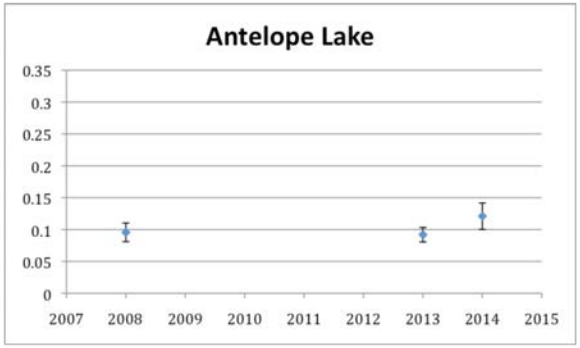
0.07 - 0.15 ppm (2 servings/week)
0.15 - 0.44 ppm (1 serving/week)
>0.44 ppm (No Consumption)
Water Board Regions
N
0
50
100 Miles
1
2
3
4
5
6
7
8
9

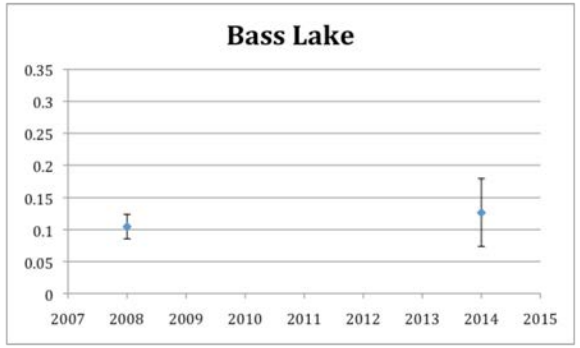


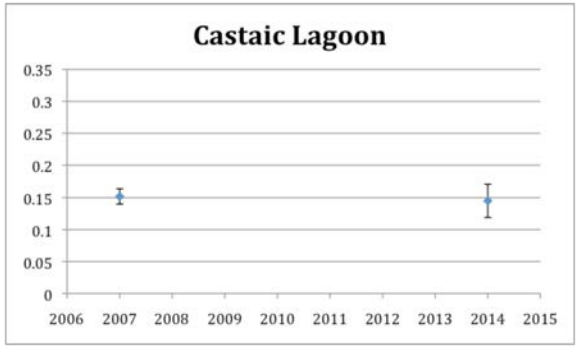
Lakes with Size-Standardized Largemouth Bass

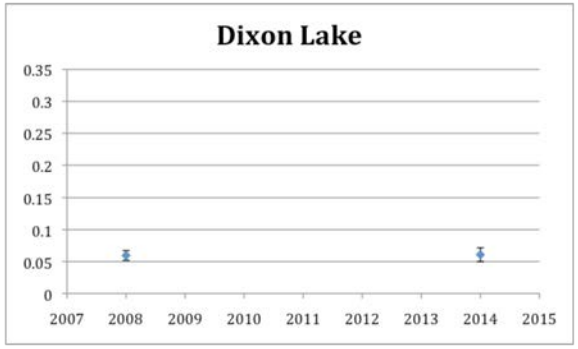
- 157 lakes sampled to date
- 11 of 16 lakes in lowest 10th percentile from Clean Lakes and Region 7 Studies (Clean Lakes in blue, Region 7 in pink)

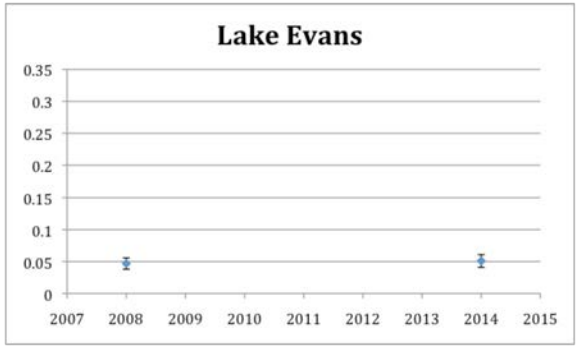
Temporal Comparison

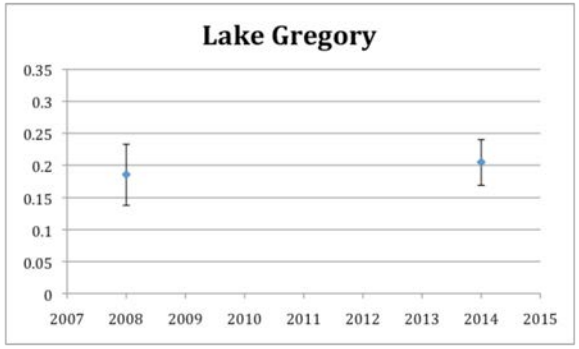


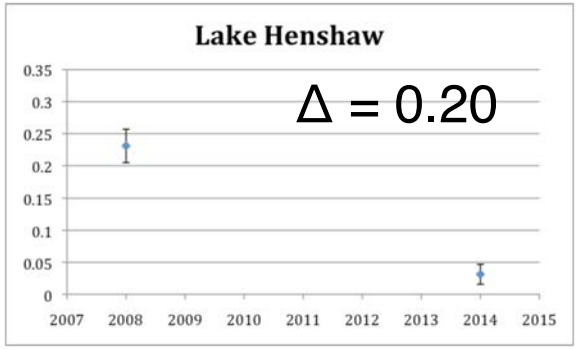


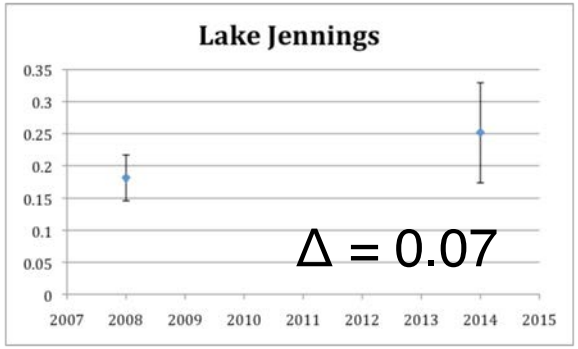


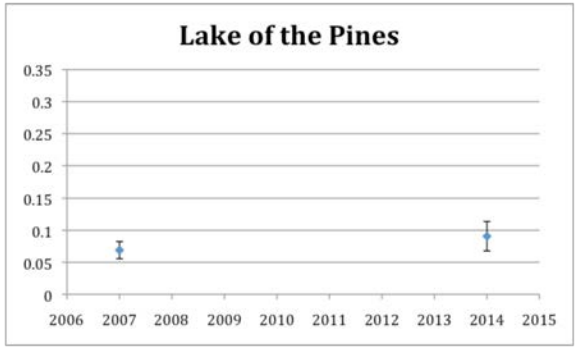




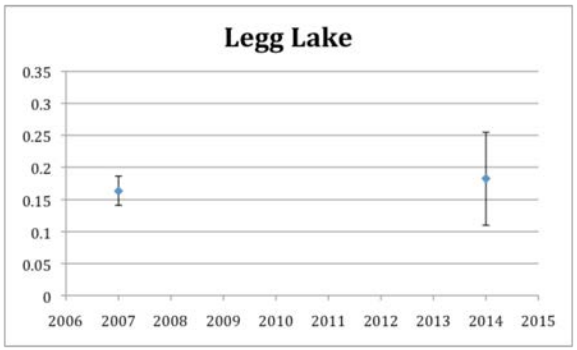


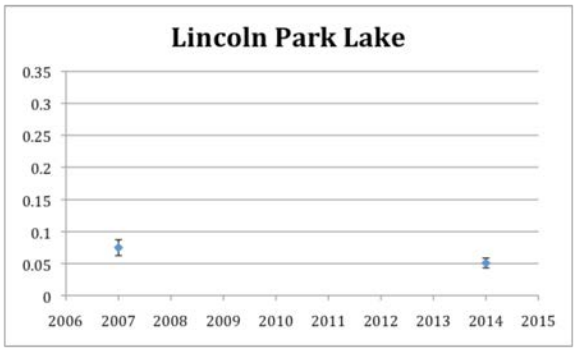


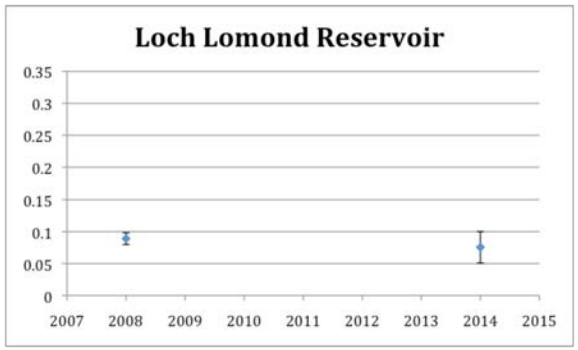


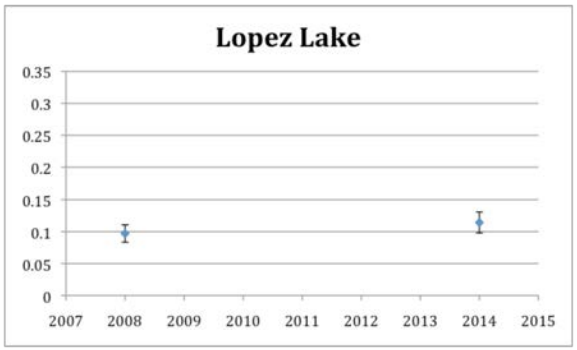


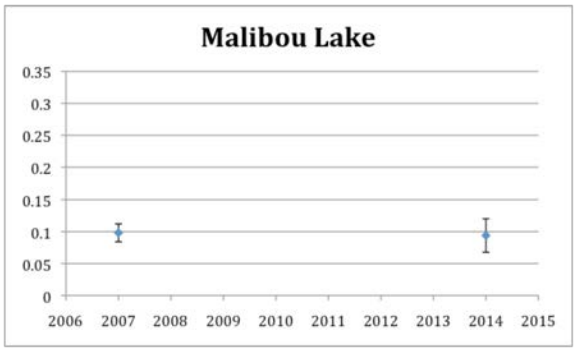
Temporal Comparison

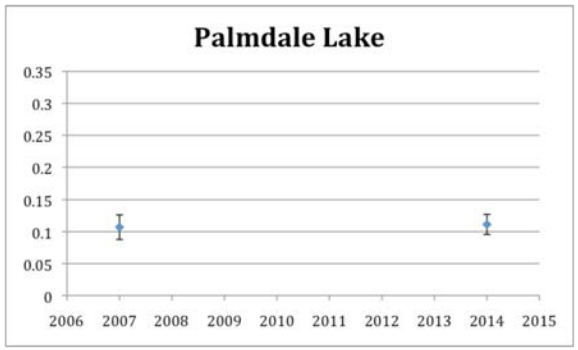


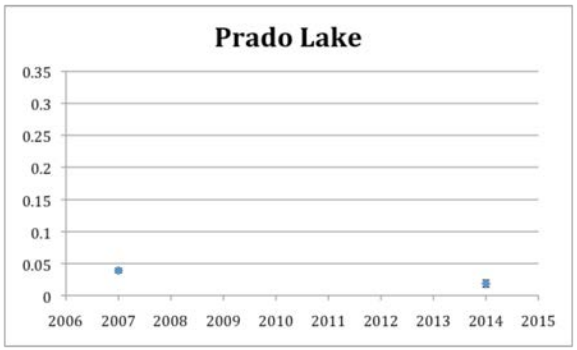


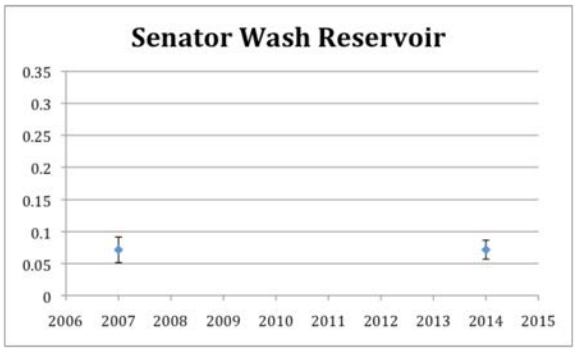




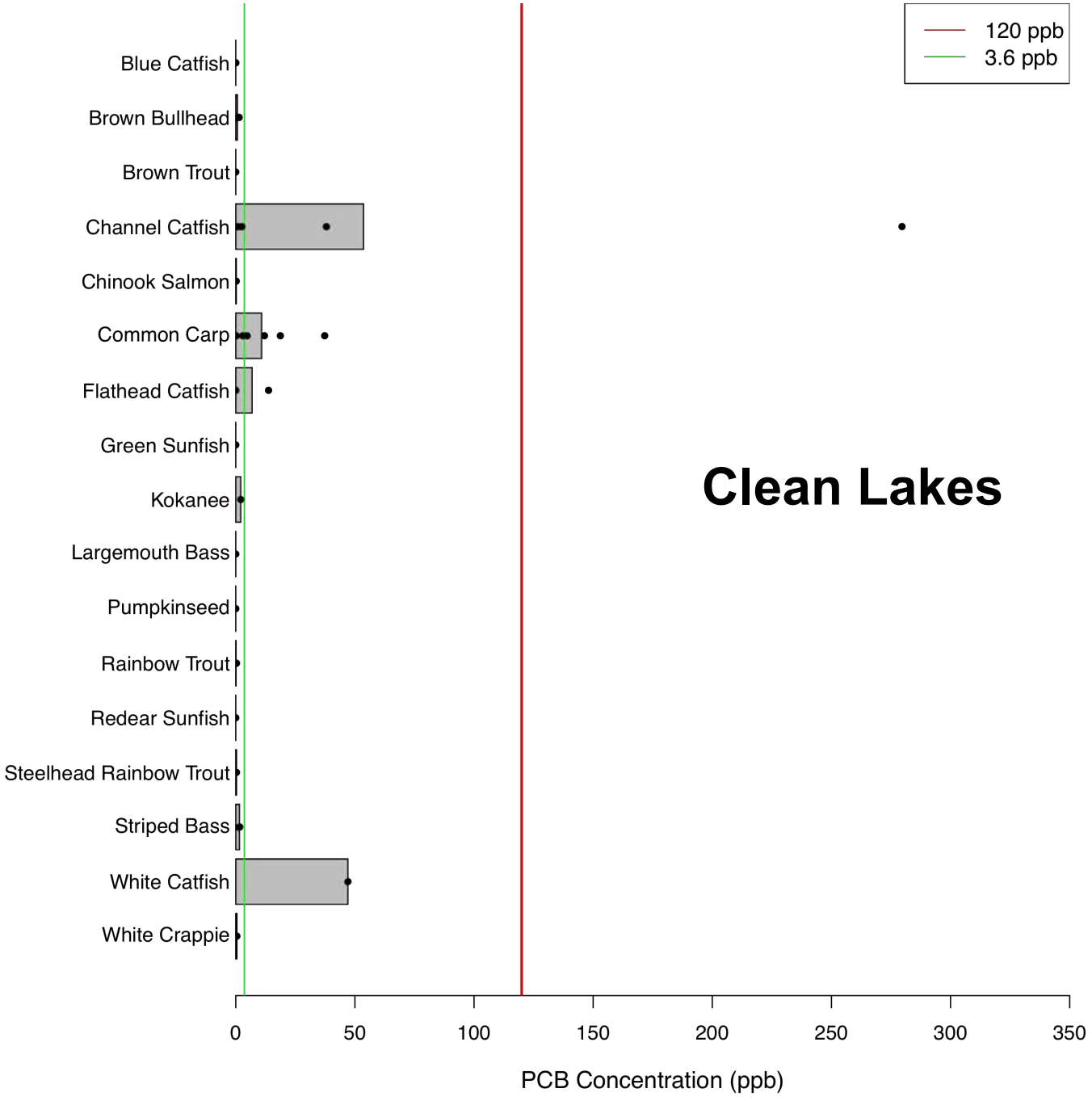


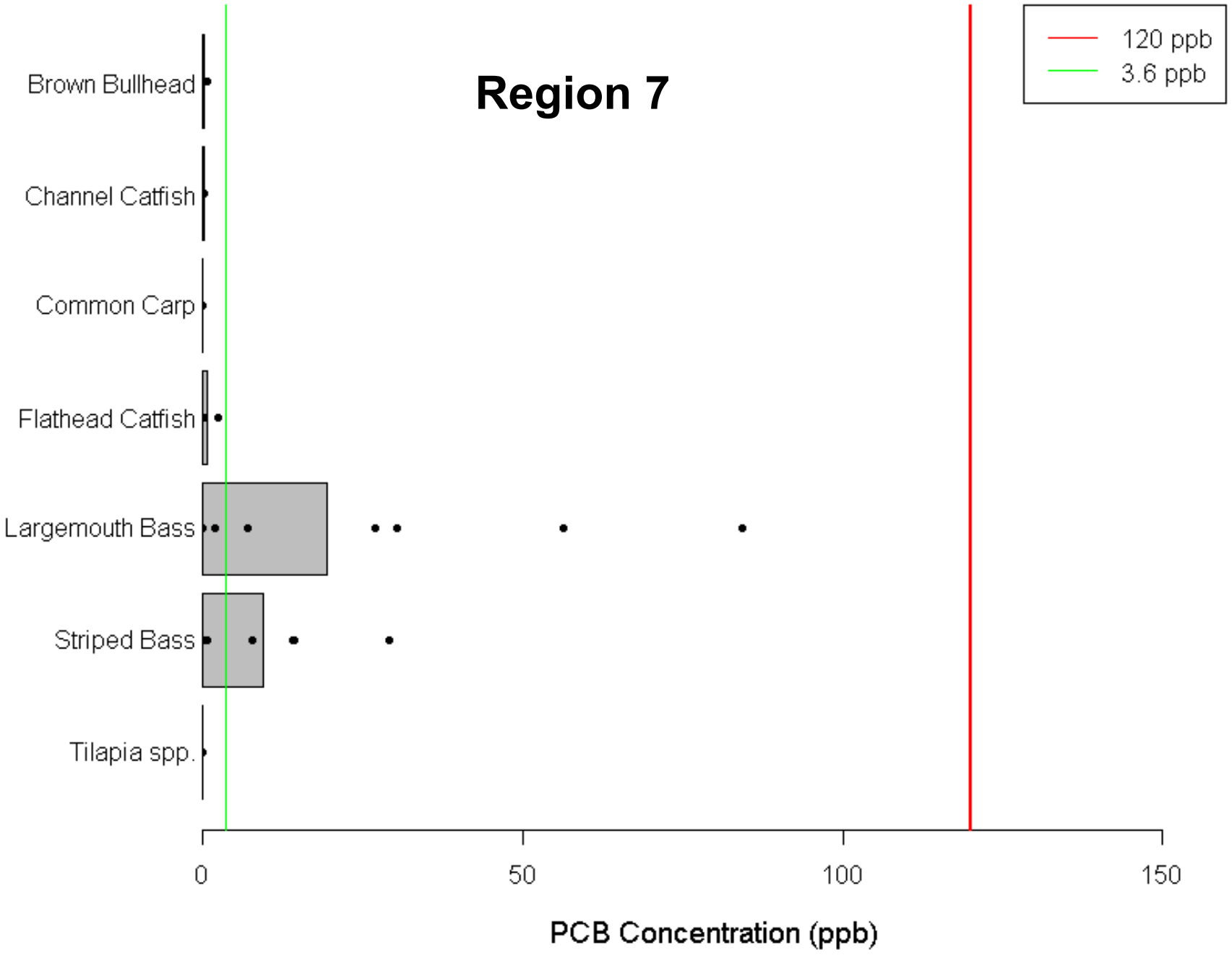




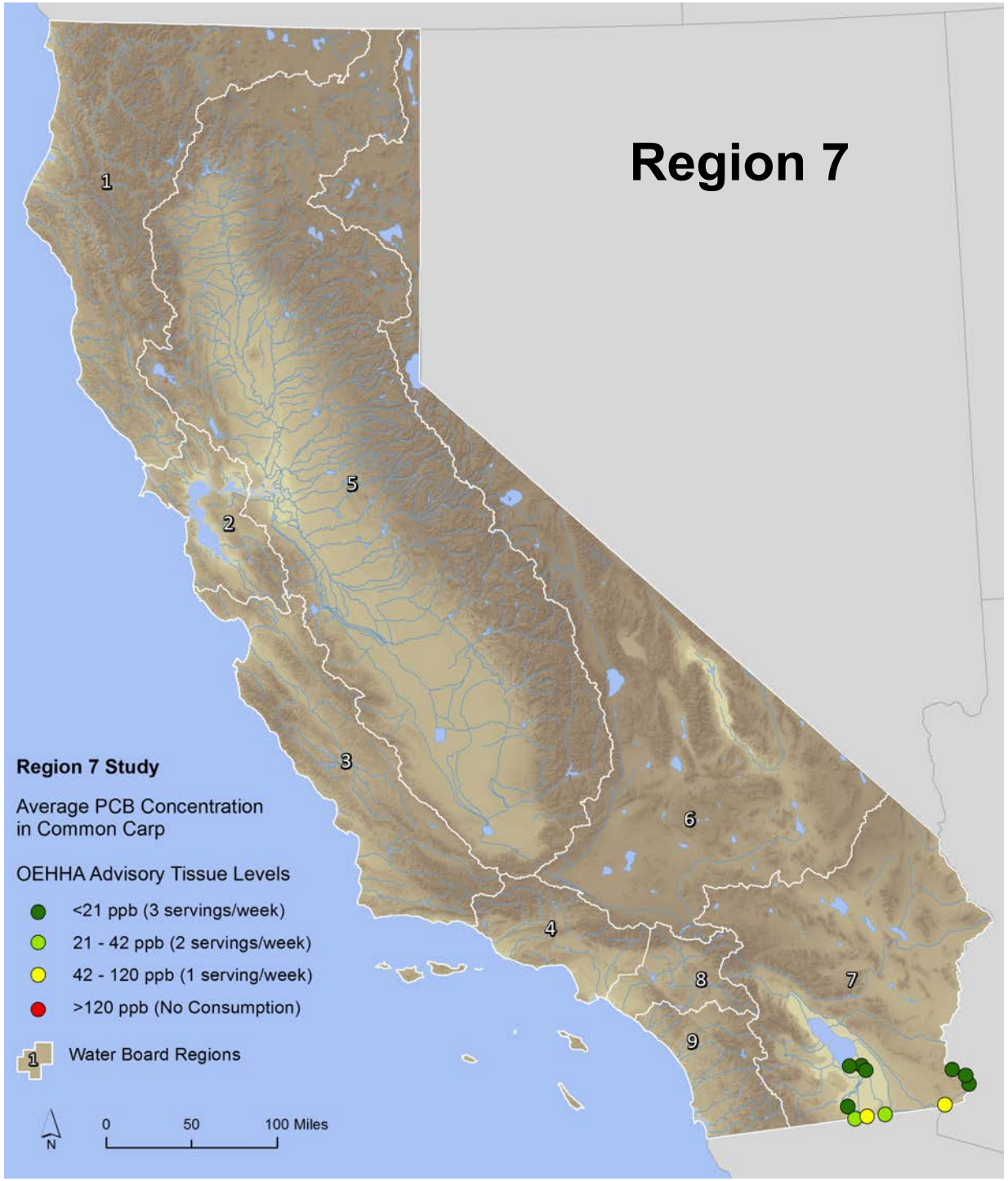


- $\Delta < 0.03$ ppm for all other lakes
- Median $\Delta = 0.02$ ppm


120 ppb
3.6 ppb
Blue Catfish
Brown Bullhead
Brown Trout
Channel Catfish
Chinook Salmon
Common Carp
Flathead Catfish
Green Sunfish
Kokanee
Largemouth Bass
Pumpkinseed
Rainbow Trout
Redear Sunfish
Steelhead Rainbow Trout
Striped Bass
White Catfish
White Crappie
Clean Lakes
0
50
100
150
200
250
300
350
PCB Concentration (ppb)


Region 7
120 ppb
3.6 ppb
Brown Bullhead
Channel Catfish
Common Carp
Flathead Catfish
Largemouth Bass
Striped Bass
Tilapia spp.
0
50
100
150
PCB Concentration (ppb)


Clean Lakes
1
2
3
4
5
6
7
8
9
Cleanest Lakes Study
Average PCB Concentration
in Common Carp
OEHHA Advisory Tissue Levels
<21 ppb (3 servings/week)
21 - 42 ppb (2 servings/week)
42 - 120 ppb (1 serving/week)
>120 ppb (No Consumption)
Water Board Regions
N
0
50
100 Miles


Region 7
1
2
3
4
5
6
7
8
9
Region 7 Study
Average PCB Concentration in Common Carp
OEHHA Advisory Tissue Levels
<21 ppb (3 servings/week)
21 - 42 ppb (2 servings/week)
42 - 120 ppb (1 serving/week)
>120 ppb (No Consumption)
Water Board Regions
N
0
50
100 Miles

Summary Table – Less-sensitive population

		Prior Data (Averages***)					This Survey (Averages)					
			Hg		PCBs		Hg		PCBs		Summary	Potential for Followup**
Region	Lake	Year	P	S	P	S	P	S	P	S		
1	Lewiston Lake	2008									*	
2	Lake Merced		No data									
3	Loch Lomond	2008									*	
3	Lopez Lake	2008										
4	Castaic Lagoon	2007										
4	Castaic Lake	2007, 2010									*	
4	Legg Lake	2007, 2010									*	X
4	Lincoln Park Lake	2007, 2010										
4	Malibou Lake	2007, 2010										X
5	Antelope Lake	2008										
5	Bass Lake	2008										
5	Caples Lake	2007									*	
5	Gold Lake	2007									*	
5	Lake of the Pines	2007									*	
6	Lake Gregory	2007										
6	Palmdale Lake	2007										
7	Senator Wash Reservoir	2007									*	X
7	Sunbeam Lake	2004										
8	Lake Evans	2008										
8	Prado Lake	2007										
9	Dixon Lake	2008									*	X
9	Lake Henshaw	2008										
9	Lake Jennings	2008										
7	Ferguson Lake	2007										
7	Finney Lake											X
7	Lake Havasu_BOG	2007										X
7	Squaw Lake											X
7	Taylor Lake											X
7	Wiest Lake_BOG	2004, 2007										X
7	Alamo River Above Drop 3											
7	Alamo River at International Boundary											
7	Alamo River Outlet	2004, 2012										
7	All American Canal at Mesa 2											
7	All American Canal, Borderline											
7	American Canal at Bridge South of Quechan Casino											
7	New River at Fig Drain	2012									*	
7	New River near Calexico Water Treatment Plant											
7	New River Outlet	2004, 2012										

*** based on 350 mm bass where available

** One round away from meeting "clean" criteria

* missing data for primary indicator species

Color Key

	Hg	PCB
Red	>1.31	>120
Orange	0.44-1.31	42-120
Yellow	0.22-0.44	21-42
Green	<0.22	<21

- 8 lakes meet all criteria
- 9 more could with one more round of sampling

Summary Table – Sensitive population

		Prior Data (Averages***)					This Survey (Averages)					
			Hg		PCBs		Hg		PCBs		Summary	Potential for Followup**
Region	Lake	Year	P	S	P	S	P	S	P	S		
1	Lewiston Lake	2008									*	
2	Lake Merced		No data									
3	Loch Lomond	2008									*	
3	Lopez Lake	2008										
4	Castaic Lagoon	2007										
4	Castaic Lake	2007, 2010									*	
4	Legg Lake	2007, 2010									*	
4	Lincoln Park Lake	2007, 2010										
4	Malibou Lake	2007, 2010										
5	Antelope Lake	2008										
5	Bass Lake	2008										
5	Caples Lake	2007									*	
5	Gold Lake	2007									*	
5	Lake of the Pines	2007									*	
6	Lake Gregory	2007										
6	Palmdale Lake	2007										
7	Senator Wash Reservoir	2007									*	X
7	Sunbeam Lake	2004										
8	Lake Evans	2008										
8	Prado Lake	2007										
9	Dixon Lake	2008										
9	Lake Henshaw	2008										
9	Lake Jennings	2008										
7	Ferguson Lake	2007										
7	Finney Lake											X
7	Lake Havasu_BOG	2007										
7	Squaw Lake											
7	Taylor Lake											X
7	Wiest Lake_BOG	2004, 2007										X
7	Alamo River Above Drop 3											
7	Alamo River at International Boundary										*	
7	Alamo River Outlet	2004, 2012									*	
7	All American Canal at Mesa 2											
7	All American Canal, Borderline											
7	American Canal at Bridge South of Quechan Casino											
7	New River at Fig Drain	2012									*	
7	New River near Calexico Water Treatment Plant											
7	New River Outlet	2004, 2012									*	

*** based on 350 mm bass where available

* missing data for primary indicator species

** One round away from meeting "clean" criteria

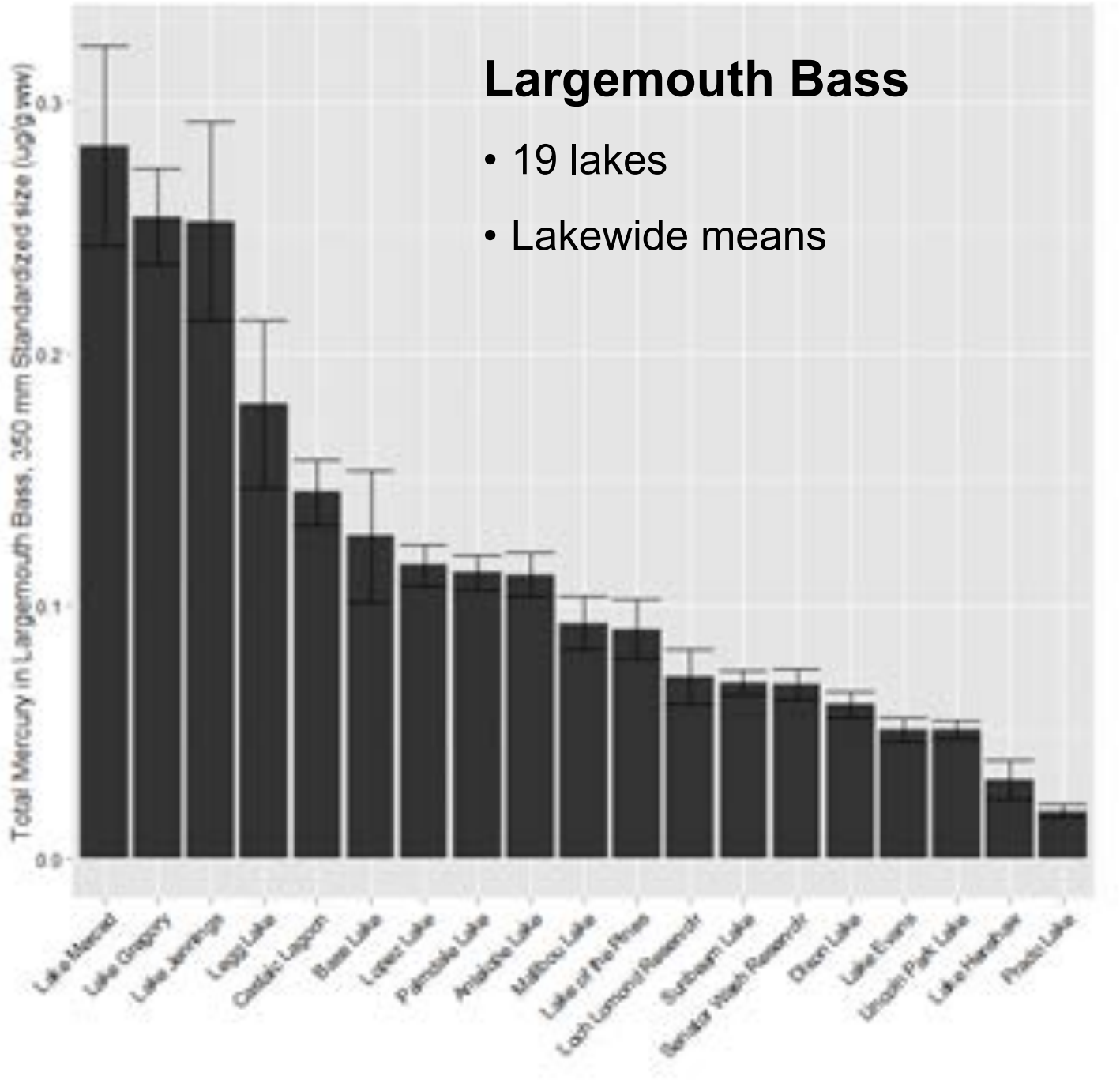
Color Key

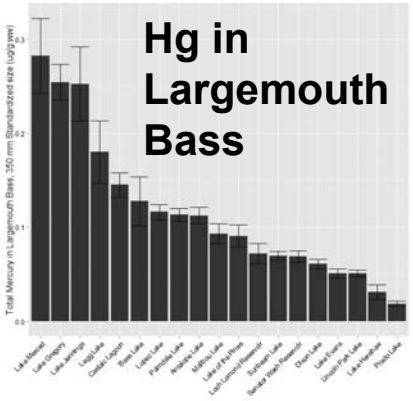
	Hg	PCB
Red	>0.44	>120
Orange	0.15-0.44	42-120
Yellow	0.07-0.15	21-42
Green	<0.07	<21

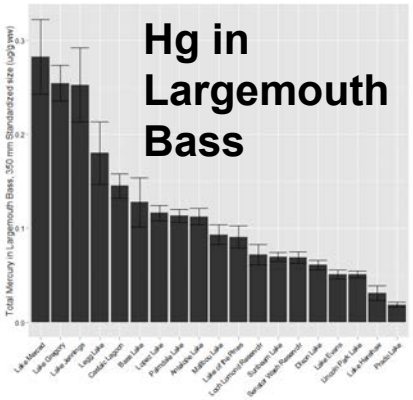
- 2 lakes meet all criteria
- 4 more could with one more round of sampling

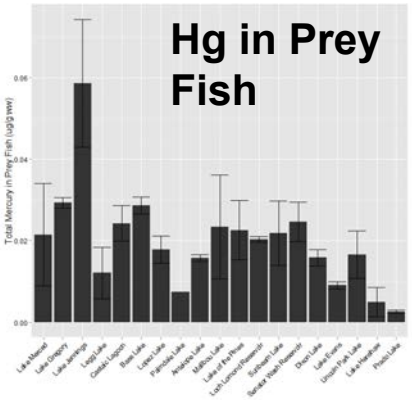
Sampling Design – 23 Lakes

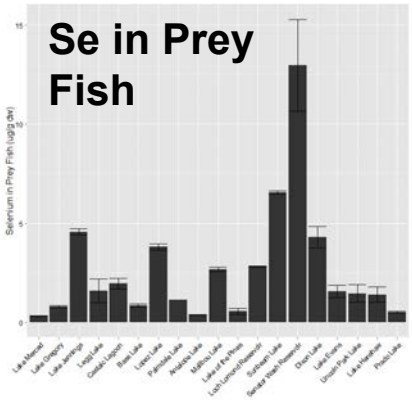
Sample Type	Number of Samples per Lake	Parameters
Largemouth Bass	10 individuals (size standardized to 350 mm)	Hg
Prey Fish	2-4 composites of ~10 individuals each	Hg, Se
Water Samples	2 samples (subsurface & near-bottom) at 3 locations in each lake (“Bank” or “Open Water”)	THg, MeHg, DOC, SO4, Chla
Sediment Samples	1 sample at 3 locations, corresponding with Water Samples	THg, MeHg
Lake Properties	NA	Dam Height, Surface Area, Perimeter, Elevation, Lake Shape Index

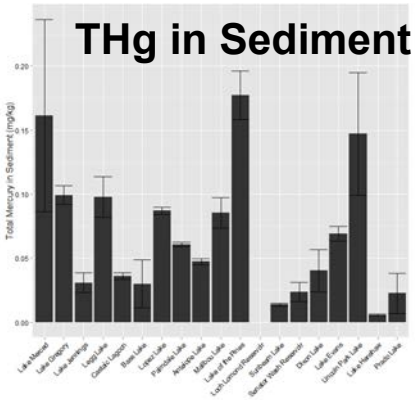

Largemouth Bass
• 19 lakes
• Lakewide means
Total Mercury in Largemouth Bass, 350 mm Standardized size (ug/g ww)
0.3
0.2
0.1
0.0
Lake Mascot
Lake Gregory
Lake Jennings
Legg Lake
Cladic Lagoon
Bass Lake
Lower Lake
Palmdale Lake
Arrastre Lake
Mallicou Lake
Lake of the Pines
Loch Lomond Reservoir
Sunbeam Lake
Sandalf Wash Reservoir
Otom Lake
Lake Evans
Lincoln Park Lake
Lake Hamilton
Prado Lake

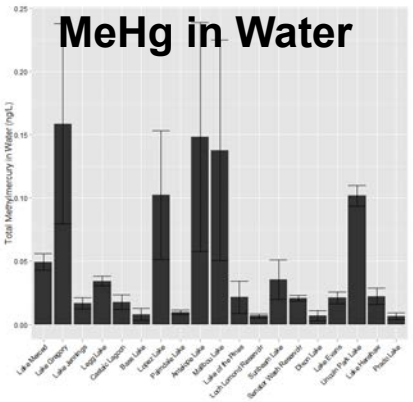

Hg in
Largemouth
Bass
Total Mercury in Largemouth Bass, 350 mm Standardized size (ug/g ww)
0.3
0.2
0.1
0.0
Lake Manuel
Lake Gregory
Lake Jennings
Loreg Lake
Central Lagoon
Rose Lake
Lotus Lake
Palmdale Lake
Amphora Lake
Mathis Lake
Lake of the Rose
Loch Lomond Reservoir
Sunbeam Lake
Senator Wash Reservoir
Dixon Lake
Lake Evans
Union Park Lake
Lake Hodges
Photo Lake

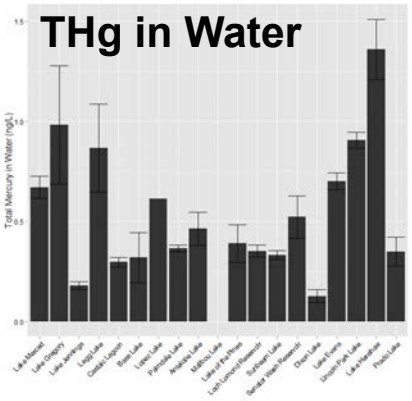

Hg in Largemouth Bass

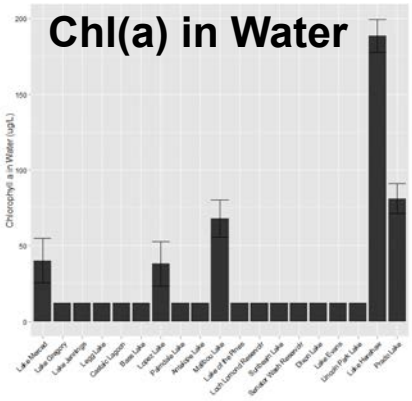

Hg in Prey Fish

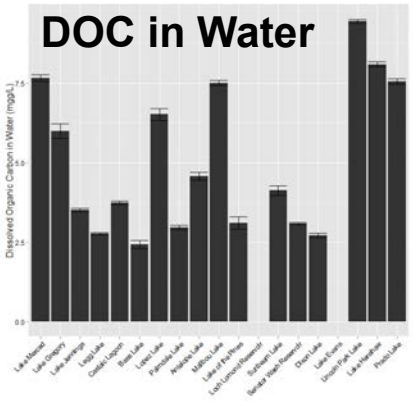

Se in Prey Fish

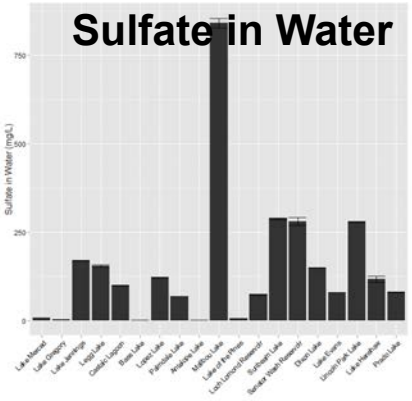

THg in Sediment

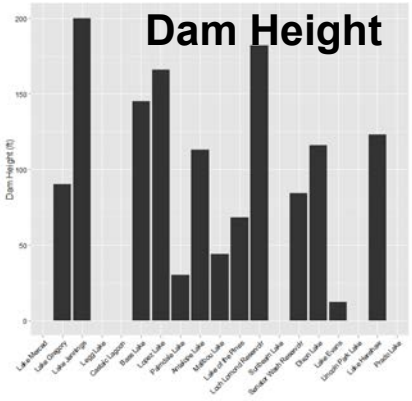

MeHg in Water


THg in Water


Chl(a) in Water


DOC in Water

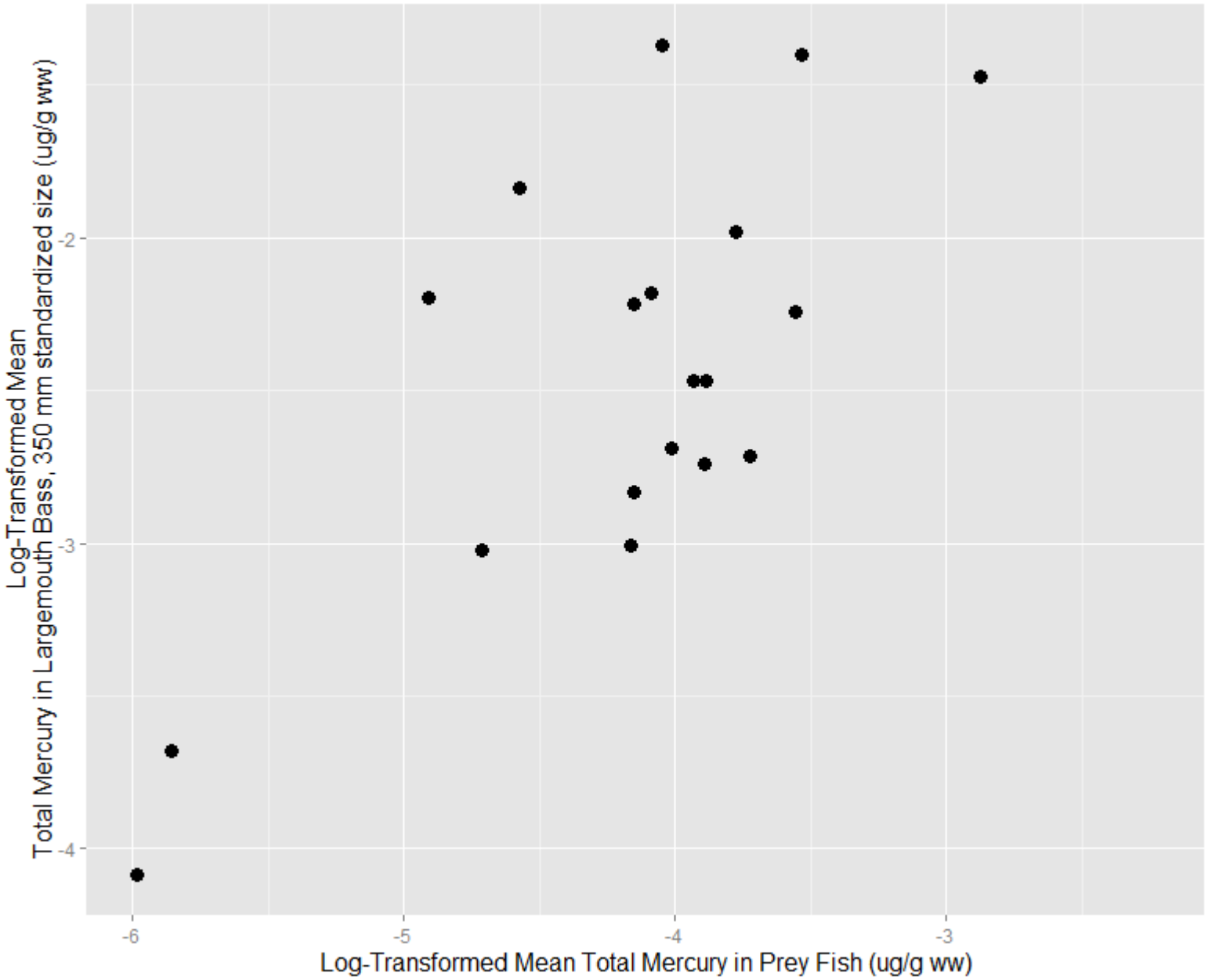

Sulfate in Water

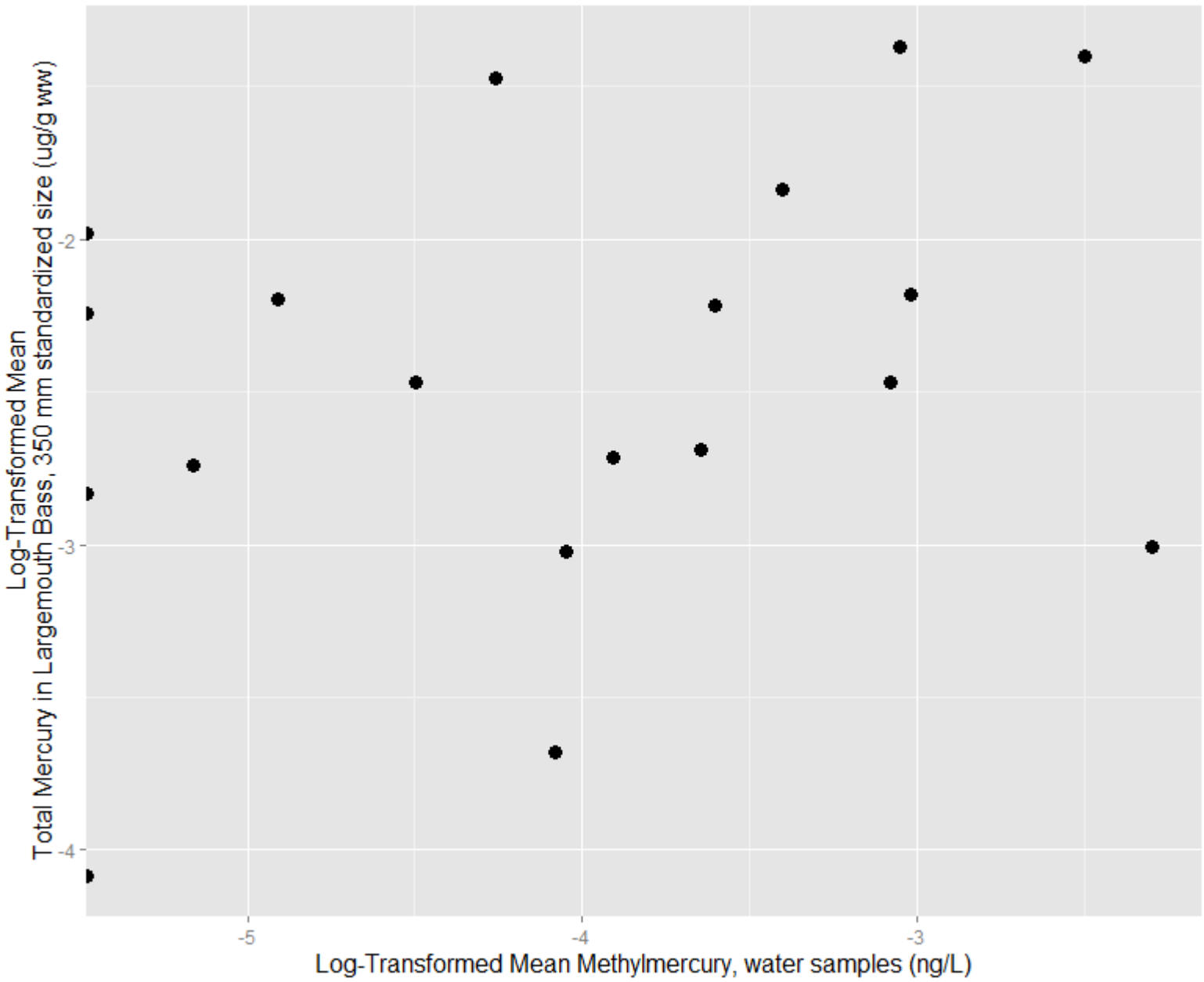

Dam Height

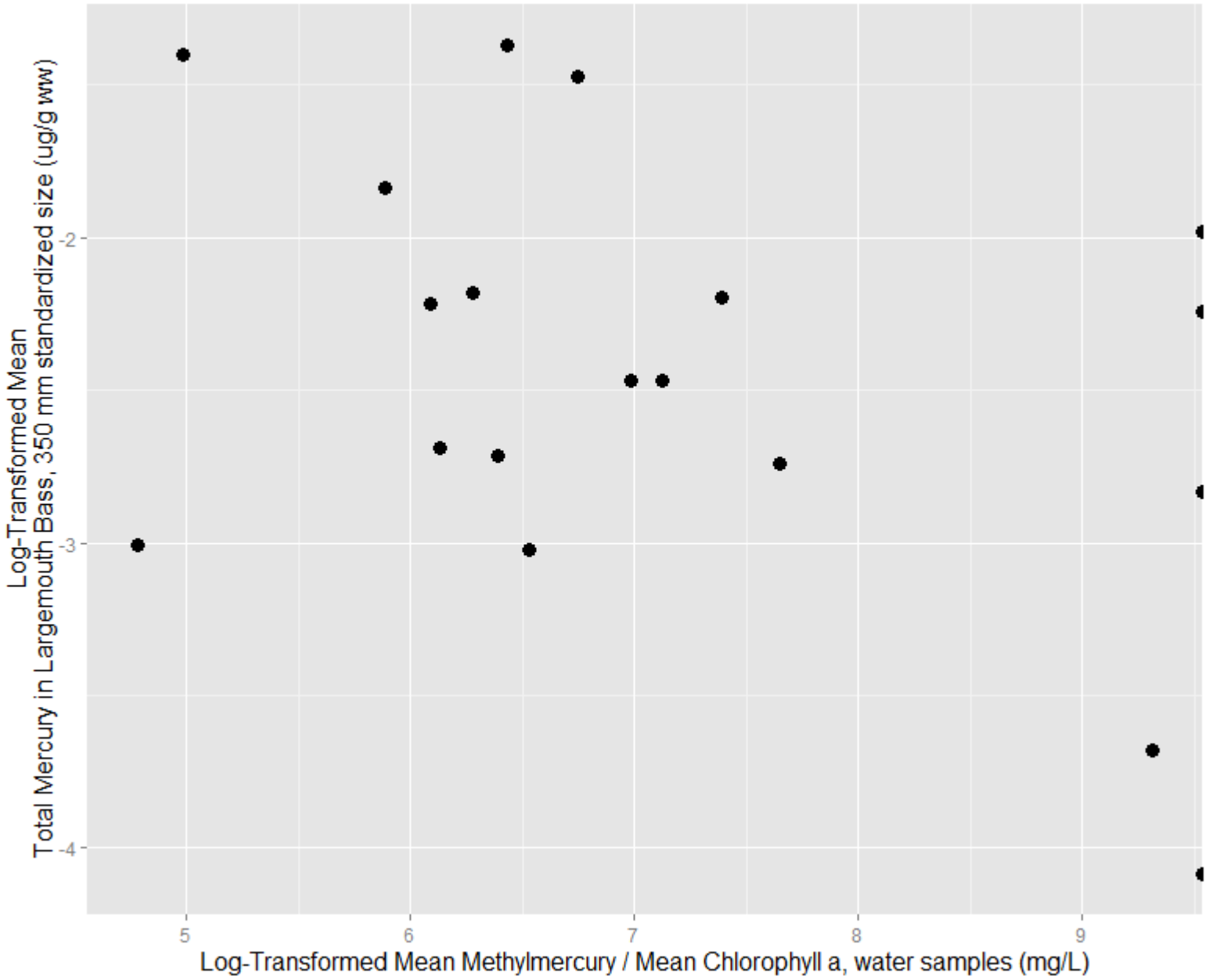
Correlation Matrix

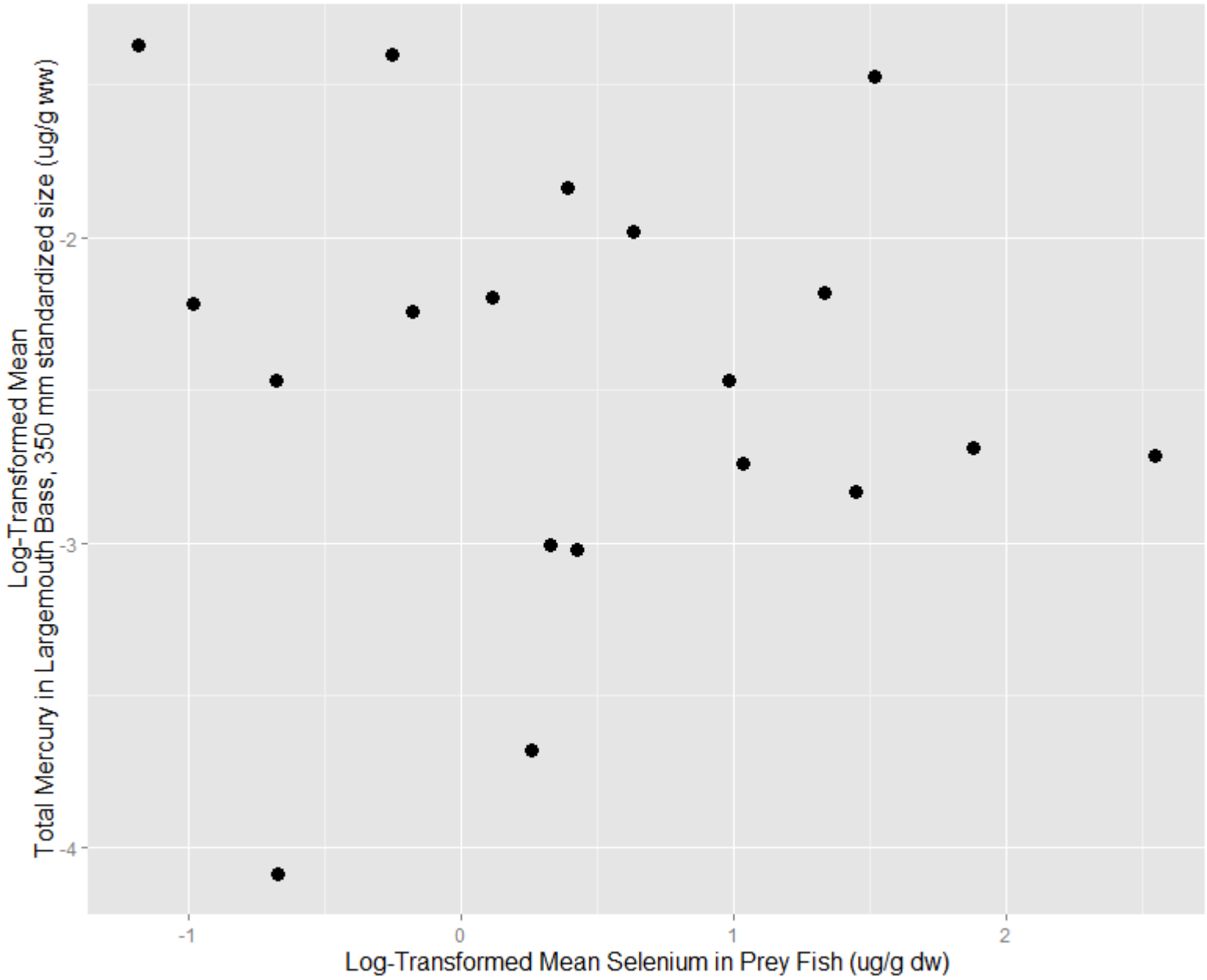
	Chl a	DOC	Largemouth Bass Hg	Laregmouth Bass Hg (350 mm std)	MeHg in water	MeHg in water, near-bottom	MeHg in water, subsurface	MeHg / Chl a	Prey Fish Hg	Prey Fish Se	Sulfate	THg in sediment	THg in water	THg in water, near-bottom	THg in water, subsurface	Lake Dam Height	Lake Surface Area	Lake Perimeter	Lake Elevation	Lake Shape Index
Chlorophyll a																				
DOC	**0.65**																			
Largemouth Bass Hg	-0.23																			
Largemouth Bass Hg (350 mm std)	-0.20	-0.22	**0.93**	0.00																
MeHg in water	0.22	**0.62**	0.16	0.29																
MeHg in water, near-bottom	0.23	**0.56**	0.14	0.30	**0.93**															
MeHg in water, subsurface	0.22	**0.61**	0.28	0.25	**0.77**	**0.60**														
MeHg / Chlorophyll a	-0.10	0.39	0.25	0.36	**0.90**	**0.83**	**0.73**													
Prey Fish Hg	-0.38	**-0.52**	**0.63**	**0.55**	-0.03	0.02	-0.04	0.12	0.00											
Prey Fish Se	-0.18	-0.11	-0.06	-0.14	-0.09	-0.06	0.13	-0.03	0.12											
Sulfate	0.24	0.42	-0.25	-0.30	0.23	0.18	**0.56**	0.19	-0.23	**0.76**										
THg in sediment	-0.13	-0.04	**0.48**	0.39	0.35	0.24	**0.47**	**0.49**	0.15	-0.36	-0.25									
THg in water	0.28	0.35	-0.09	-0.06	**0.58**	**0.60**	**0.44**	0.39	-0.19	-0.24	0.01	0.40								
THg in water, near-bottom	0.17	0.25	0.00	0.03	**0.60**	**0.71**	0.31	0.39	-0.11	-0.17	-0.06	0.29	**0.94**							
THg in water, subsurface	**0.44**	**0.46**	-0.24	-0.21	**0.51**	**0.46**	**0.50**	0.31	-0.38	-0.28	0.09	0.41	**0.91**	**0.75**						
Lake Dam Height	-0.07	-0.19	0.15	0.10	-0.18	-0.18	-0.39	-0.25	0.23	0.26	-0.15	-0.29	-0.11	-0.06	-0.25					
Lake Surface Area	0.08	-0.34	0.11	0.19	-0.18	-0.10	**-0.58**	-0.32	0.28	-0.24	**-0.58**	-0.19	0.04	0.09	-0.06	**0.55**				
Lake Perimeter	0.03	-0.33	0.15	0.17	-0.18	-0.10	**-0.55**	-0.26	0.31	-0.04	**-0.44**	-0.19	-0.03	-0.02	-0.11	**0.63**	**0.93**			
Lake Elevation	-0.25	**-0.44**	-0.01	0.09	-0.18	-0.13	**-0.51**	-0.21	0.31	**-0.46**	**-0.75**	0.04	-0.06	0.05	-0.19	0.28	**0.56**	0.37		
Lake Shape Index	-0.30	-0.37	0.22	0.25	0.04	0.02	-0.24	0.11	0.34	0.20	-0.21	-0.09	-0.03	-0.04	-0.12	**0.52**	**0.50**	**0.66**	0.05	

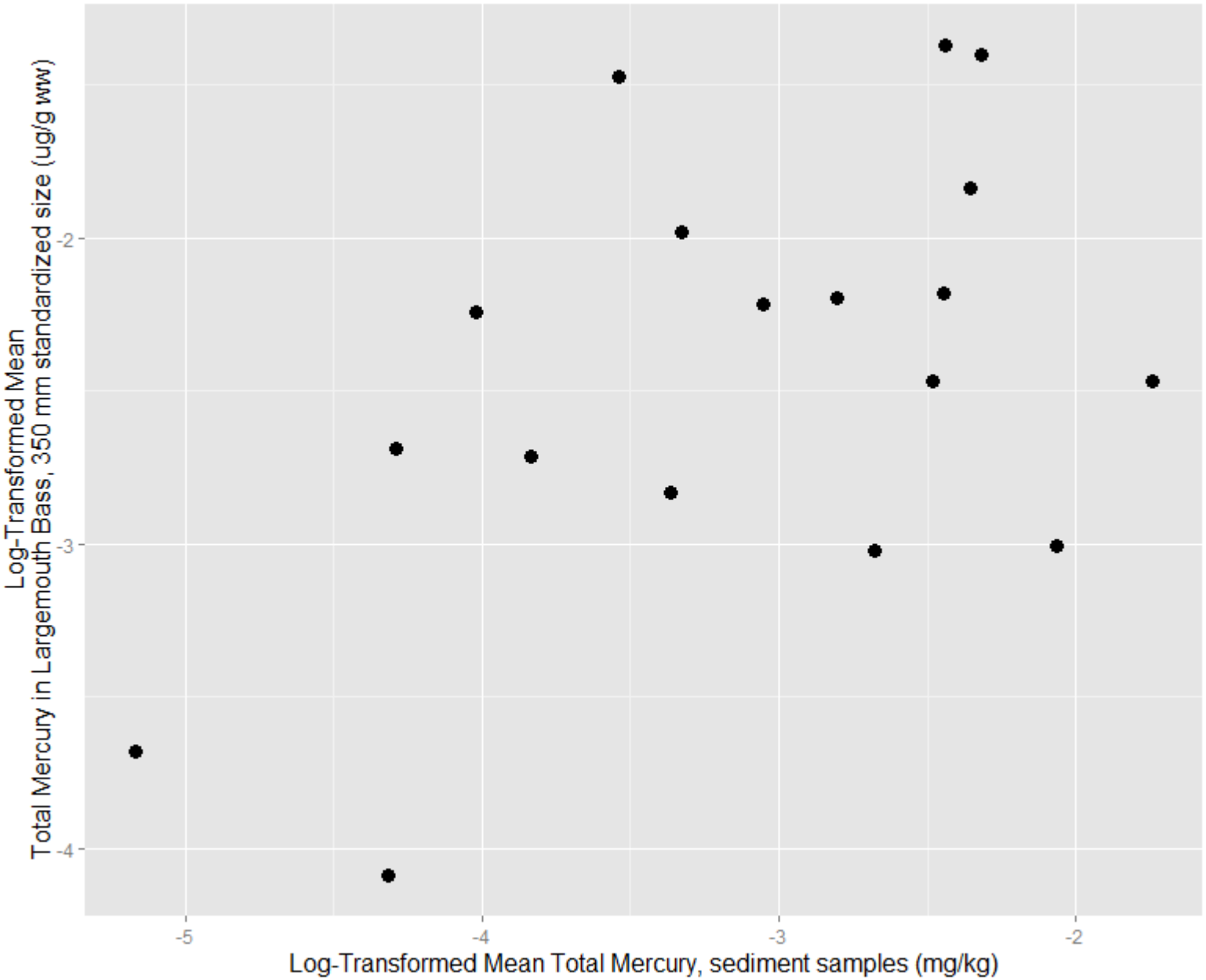
SWAMP
Surface Water Ambient Monitoring Program

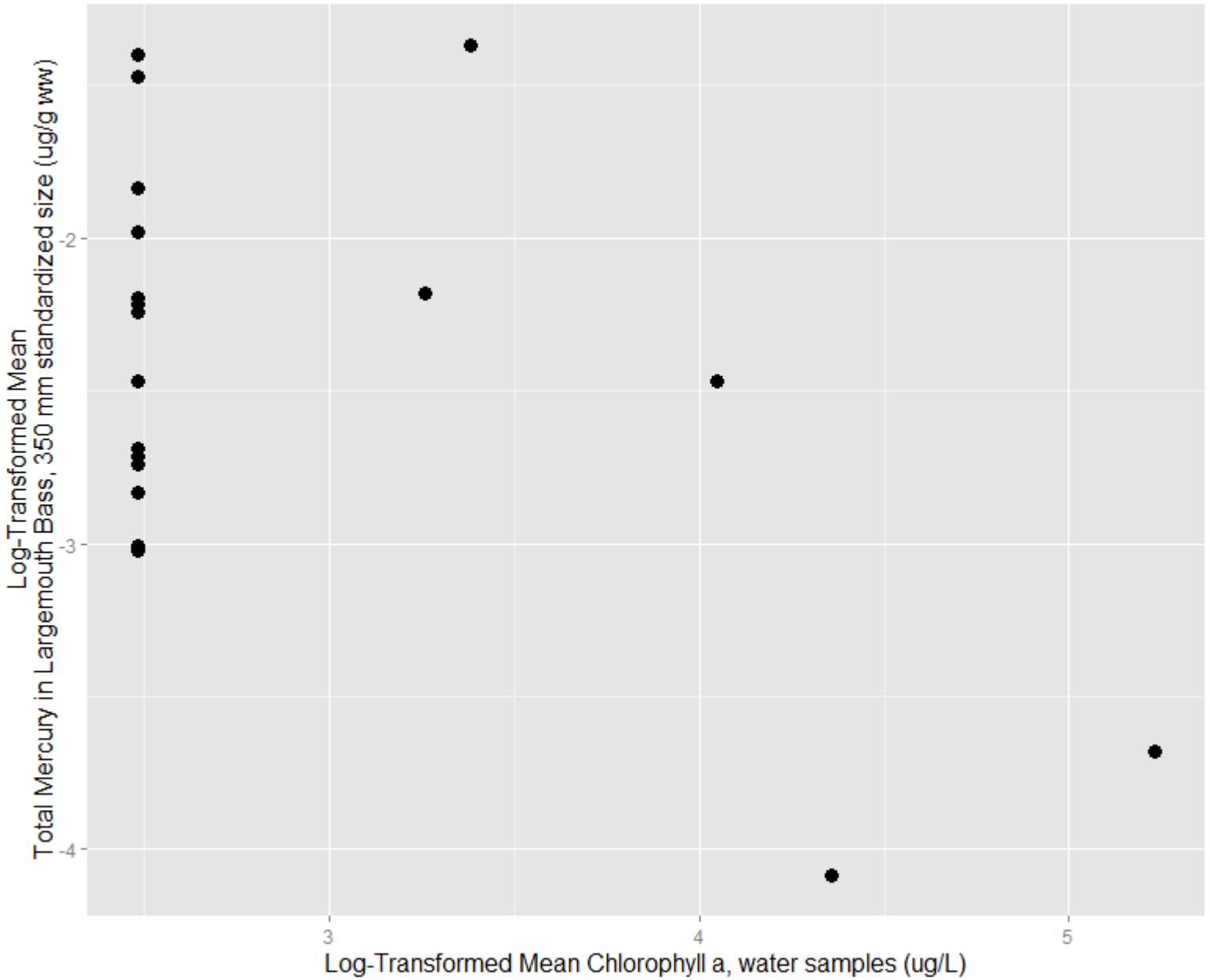

Log-Transformed Mean
Total Mercury in Largemouth Bass, 350 mm standardized size (ug/g ww)
-2
-3
-4
-6
-5
-4
-3
Log-Transformed Mean Total Mercury in Prey Fish (ug/g ww)

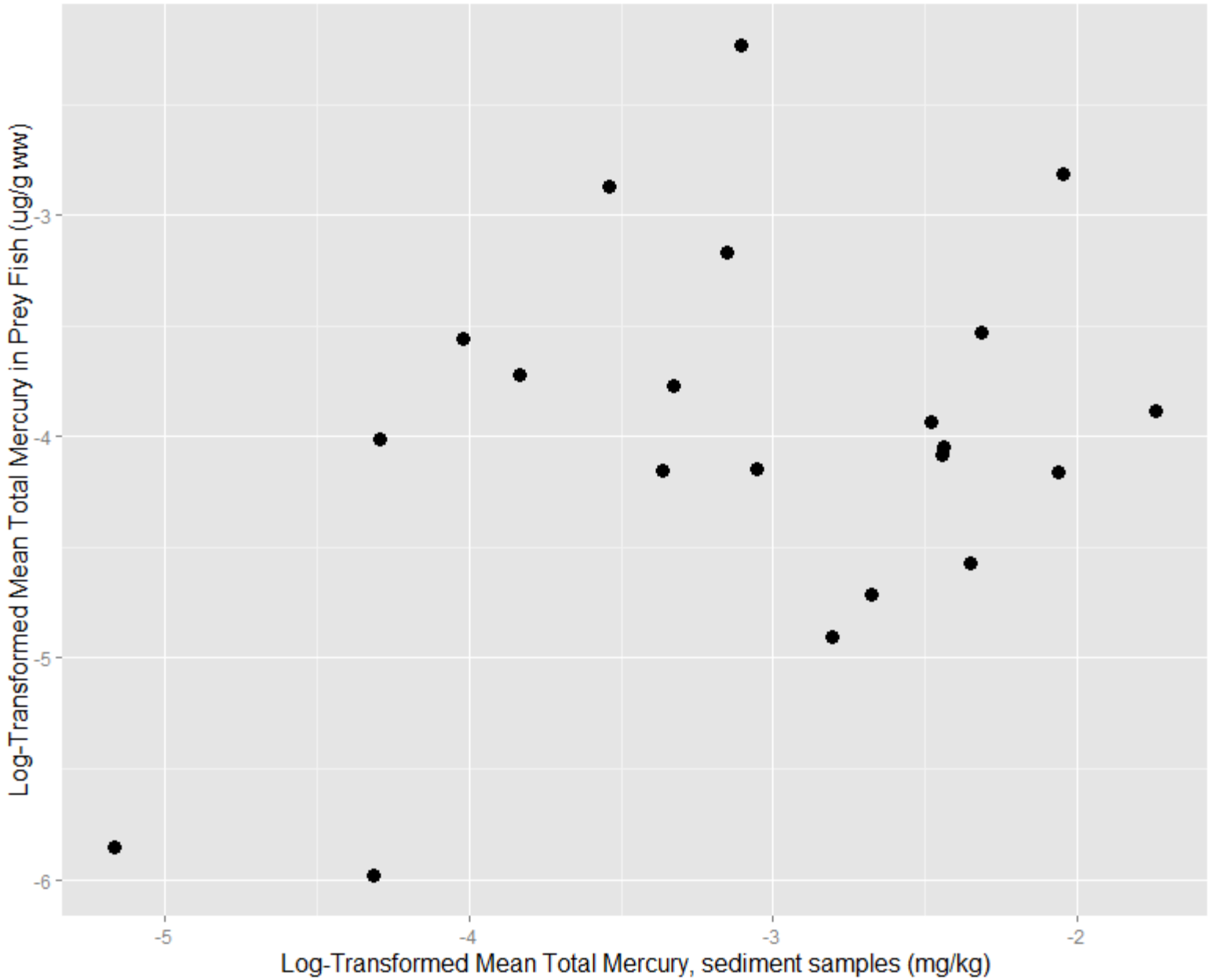

Log-Transformed Mean
Total Mercury in Largemouth Bass, 350 mm standardized size (ug/g ww)
-2
-3
-4
-5
-4
-3
Log-Transformed Mean Methylmercury, water samples (ng/L)


Log-Transformed Mean
Total Mercury in Largemouth Bass, 350 mm standardized size (ug/g ww)
-2
-3
-4
5
6
7
8
9
Log-Transformed Mean Methylmercury / Mean Chlorophyll a, water samples (mg/L)


Log-Transformed Mean
Total Mercury in Largemouth Bass, 350 mm standardized size (ug/g ww)
-2
-3
-4
-1
0
1
2
Log-Transformed Mean Selenium in Prey Fish (ug/g dw)


Log-Transformed Mean
Total Mercury in Largemouth Bass, 350 mm standardized size (ug/g ww)
-2
-3
-4
-5
-4
-3
-2
Log-Transformed Mean Total Mercury, sediment samples (mg/kg)


Log-Transformed Mean
Total Mercury in Largemouth Bass, 350 mm standardized size (ug/g ww)
-2
-3
-4
3
4
5
Log-Transformed Mean Chlorophyll a, water samples (ug/L)


Log-Transformed Mean Total Mercury in Prey Fish (ug/g ww)
-3
-4
-5
-6
-5
-4
-3
-2
Log-Transformed Mean Total Mercury, sediment samples (mg/kg)

Mixed-Effects Models – Clean Lakes

- Dependent Variable: Largemouth Bass, 350 mm size standardized (log transformed)
- Random Variable
  1. Lake – account for spatial autocorrelation
  2. Prey Species / Lake (nested random effect)
- Fixed Variables: various additive combinations of:
  - Prey fish Hg
  - Water parameter (MeHg/Chla, SO4)
  - Sediment parameter (Total Mercury)
  - Lake property parameter (Dam Height)
  - May continue to investigate others?

Evaluating Models

- Model selection: Akaike Information Criterion coefficient (AICc)
  - Used to compare between models run with the same random effect
  - Evaluates tradeoffs between model goodness of fit and complexity
  - Lower AICcs = better model (ie. for interpretation of the table)
- Identifying significant parameters: p-value for each fixed variable
- Model runs and statistical criteria calculations done in R (nlme package)

MQ1: Which popular lakes in California can be confirmed to have relatively low concentrations of contaminants in sport fish?

- Women over 45 and Men
  - 8 lakes meet all criteria
  - 9 more could meet all criteria with one more round of sampling
- Women 18-45 and Children 1-17
  - 2 lakes meet all criteria
  - 4 more could with one more round of sampling
- Mercury
  - Many lakes confirmed to be at the clean end of the distribution

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MQ2: Why do some lakes have relatively low concentrations of methylmercury in sport fish?

- Stay tuned…

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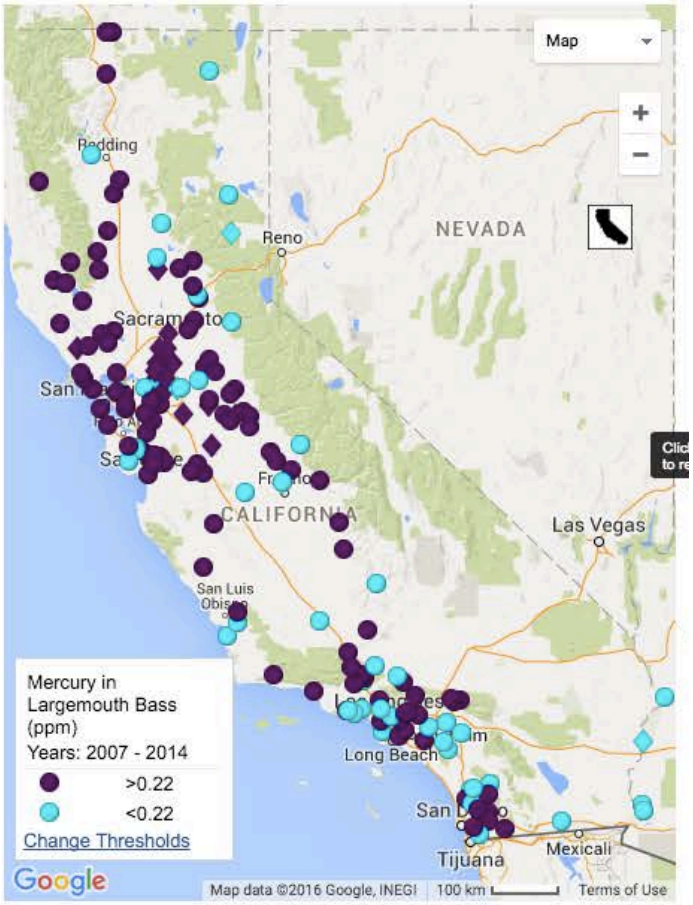
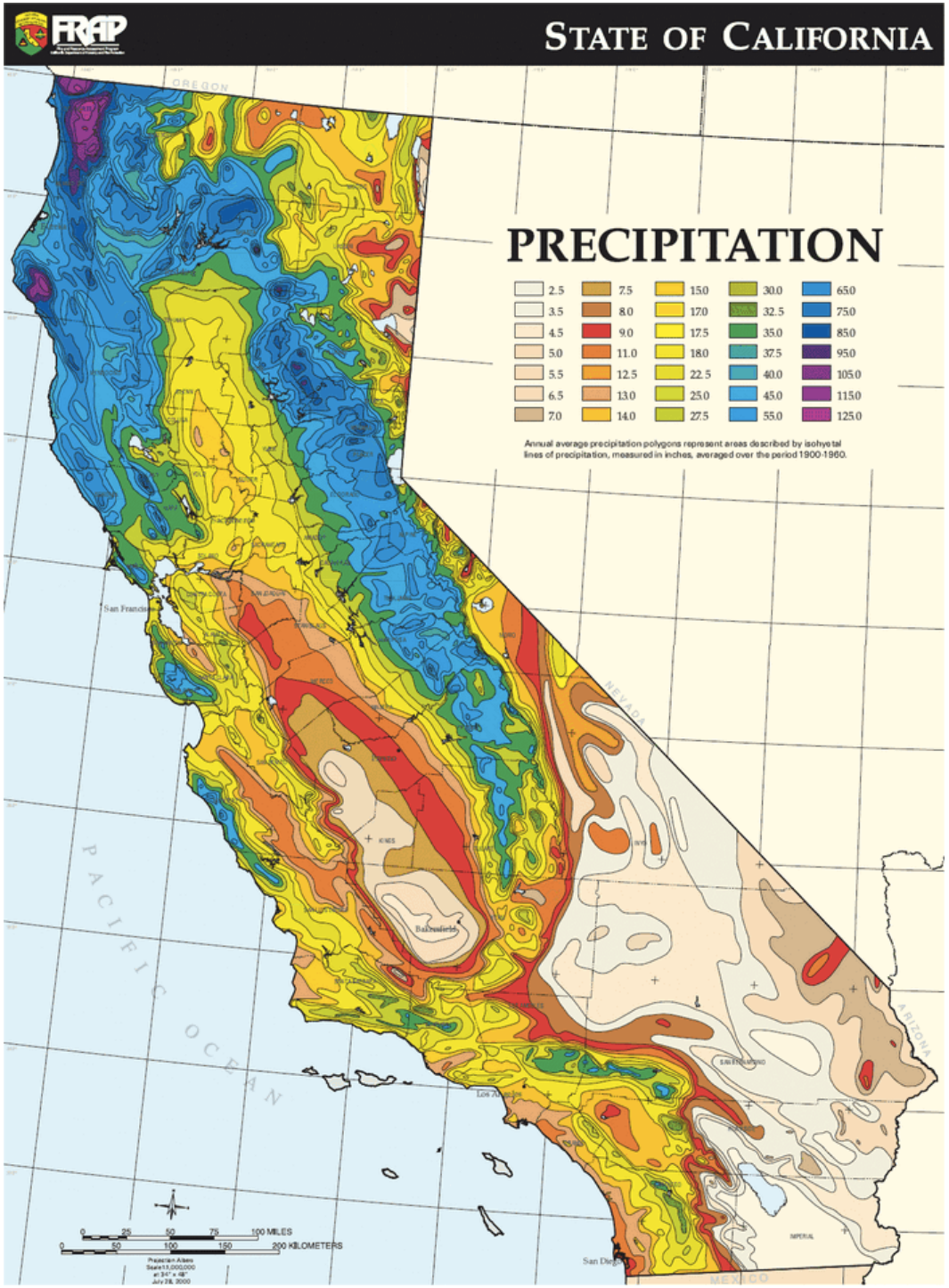

Map
Redding
Reno
NEVADA
Sacramento
San Francisco
Fresno
CALIFORNIA
Las Vegas
San Luis Obispo
Long Beach
San Diego
Tijuana
Mexicali
Mercury in Largemouth Bass (ppm)
Years: 2007 - 2014
>0.22
<0.22
Change Thresholds
Google
Map data ©2016 Google, INEGI
100 km
Terms of Use


FRAP
STATE OF CALIFORNIA
PRECIPITATION
2.5 3.5 4.5 5.0 5.5 6.5 7.0
7.5 8.0 9.0 11.0 12.5 13.0 14.0
15.0 17.0 17.5 18.0 22.5 25.0 27.5
30.0 32.5 35.0 37.5 40.0 45.0 55.0
65.0 75.0 85.0 95.0 105.0 115.0 125.0
Annual average precipitation polygons represent areas described by isohyetal lines of precipitation, measured in inches, averaged over the period 1900-1960.
PACIFIC OCEAN
100 MILES
200 KILOMETERS

MQ3: Did the 2007-8 survey accurately characterize the status of lakes in which only rainbow trout were collected?

- Minimally addressed – 3 lakes

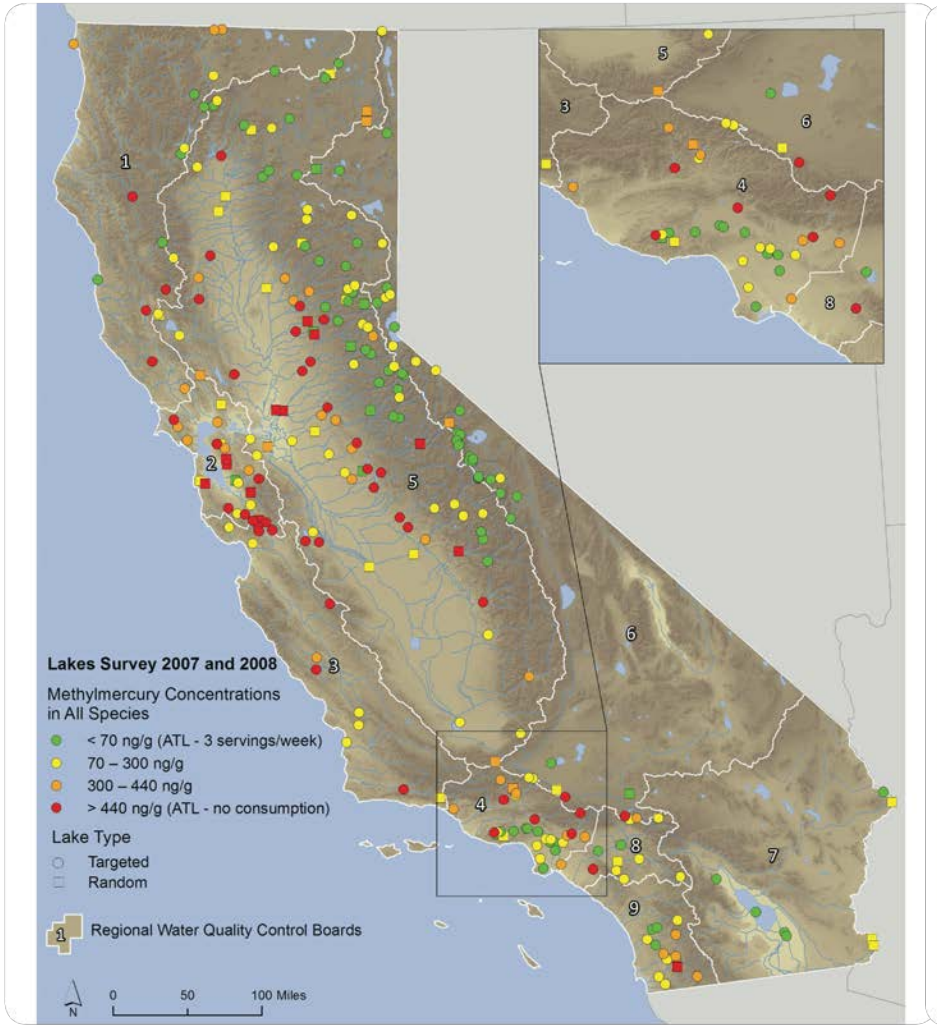


Figure 2. Spatial patterns in methylmercury concentrations (ng/g wet weight) in lakes sampled in the Lakes Survey, 2007-2008. Each point represents the highest average methylmercury concentration among the species sampled in each lake. Concentrations based on location composites, and individual fish, from both targeted (circles) and random (squares) lakes.

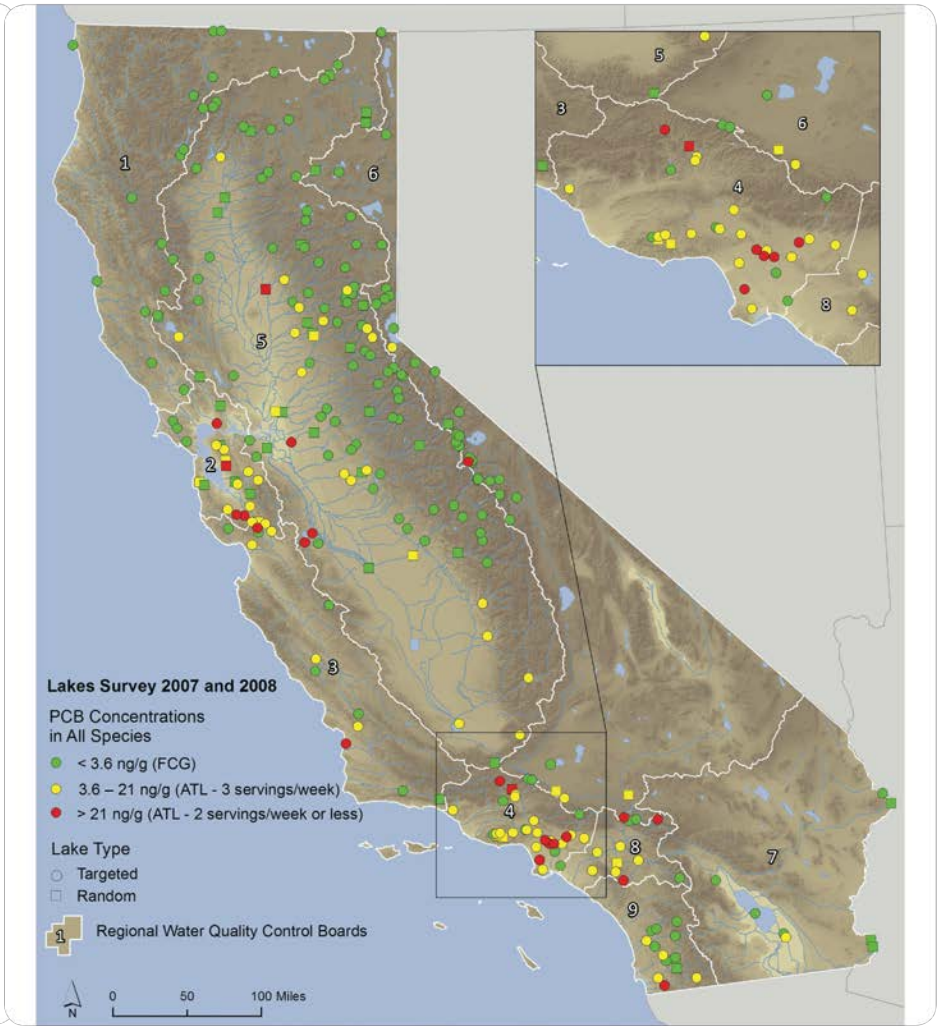


Figure 7. Spatial patterns in PCB concentrations (ng/g wet weight) at lakes sampled in the Lakes Survey. Each point represents the highest average concentration among the species sampled in each lake. Concentrations based on lake-wide and location composites, from both targeted (circles) and random (squares) lakes. Note different scale from the methylmercury maps, with the two serving ATL as the highest threshold.

MQ3: Did the 2007-8 survey accurately characterize the status of lakes in which only rainbow trout were collected?

- Minimally addressed – 3 lakes
- Would require greater effort per lake
- Significant information gap

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Discussion/Review Points

1. Use of ATLs
2. Was the study and the analysis technically sound?
3. Did we answer the management questions?
4. What important information gaps remain?

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Item 4: Revised Safe to Eat Portal

- Desired Outcomes: Provide progress report, obtain input from the group

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Subcommittee on Communicating SWAMP Data to the Public

1. Discussed in September meeting
2. Subcommittee met in January
3. Agreed on criteria
   - Simple, easy to understand
   - Convey the right message (not be misleading)
   - Consistent with existing or future OEHHA consumption advice

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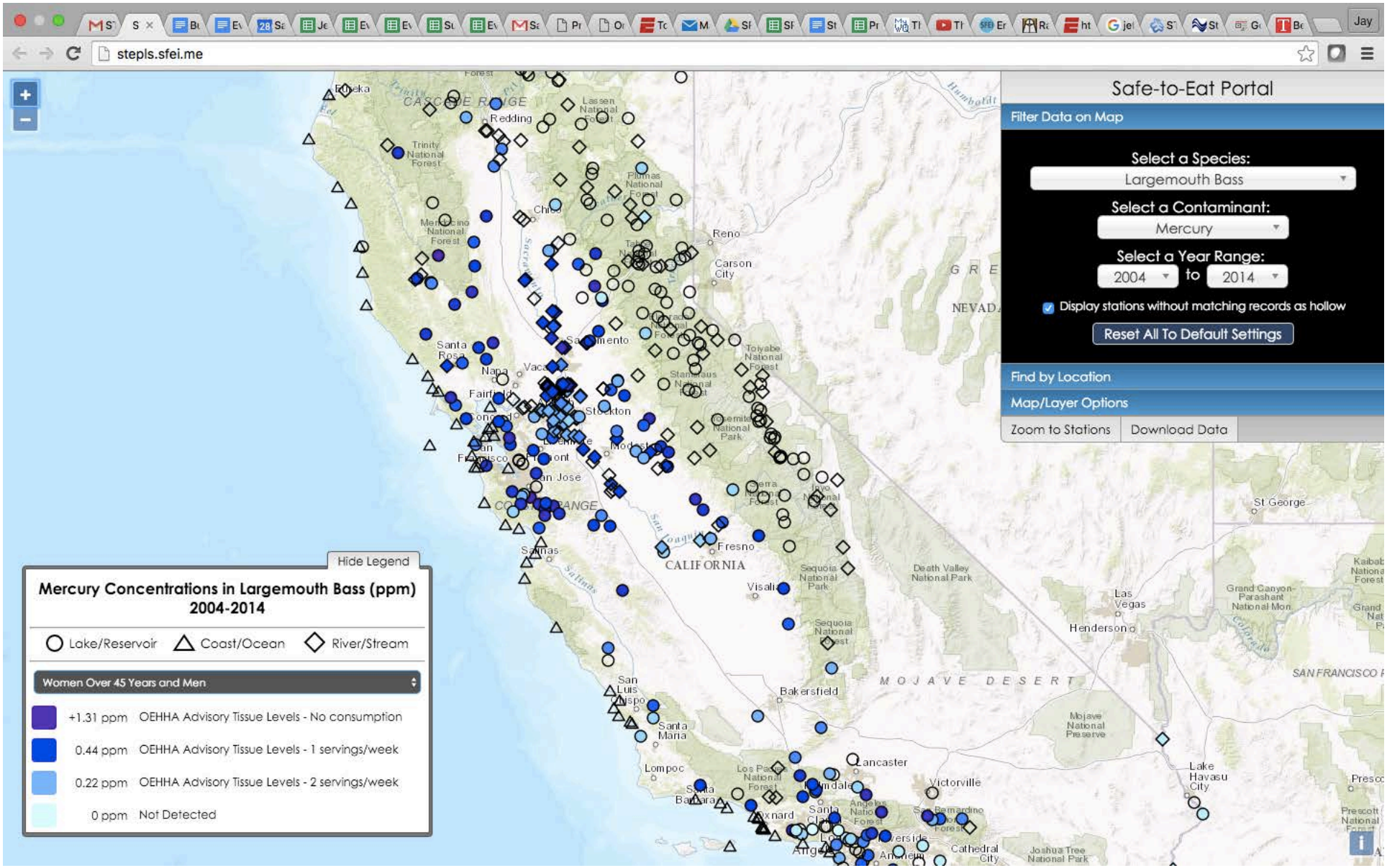
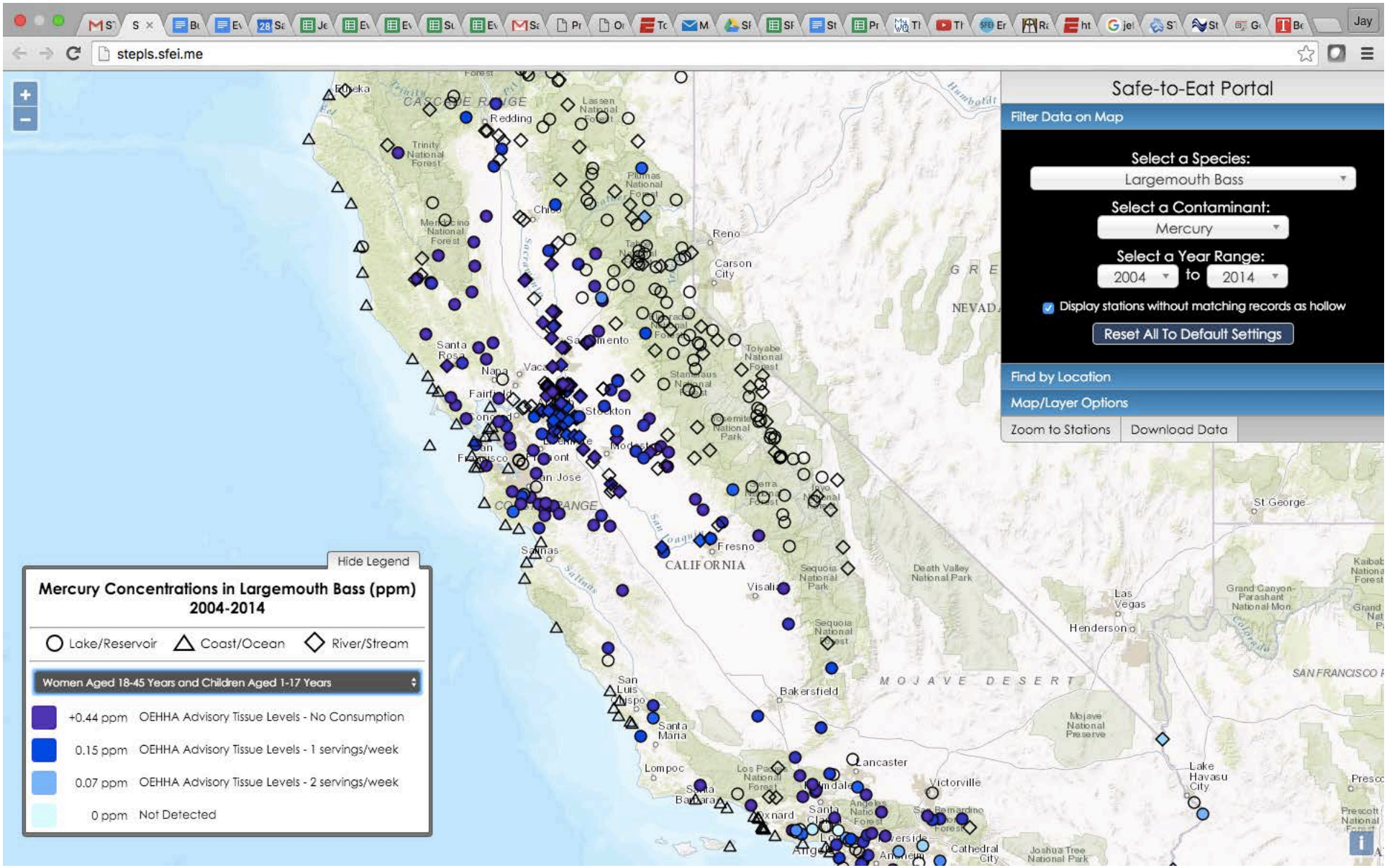
Revised Portal Opening Map – Less-sensitive Population

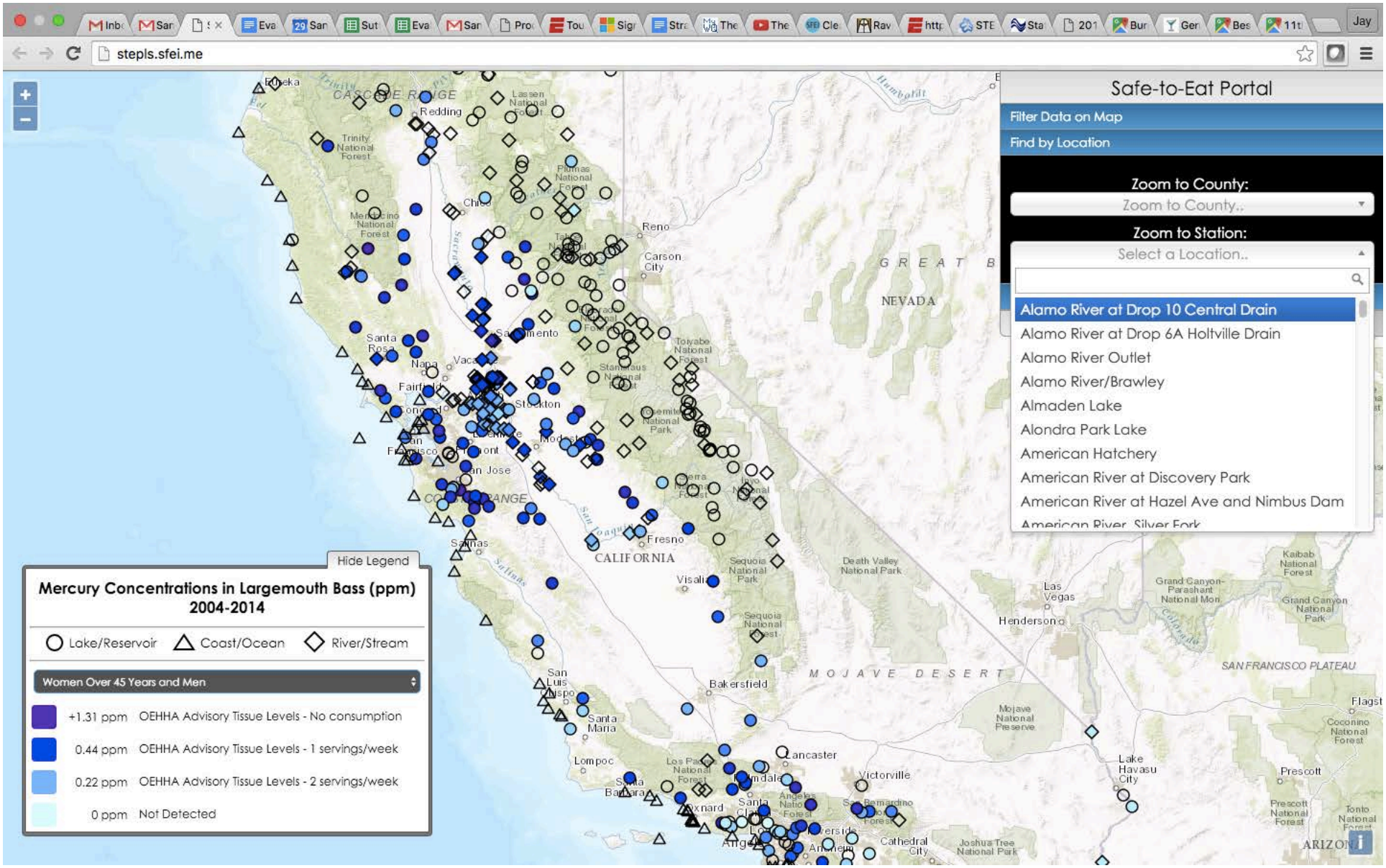


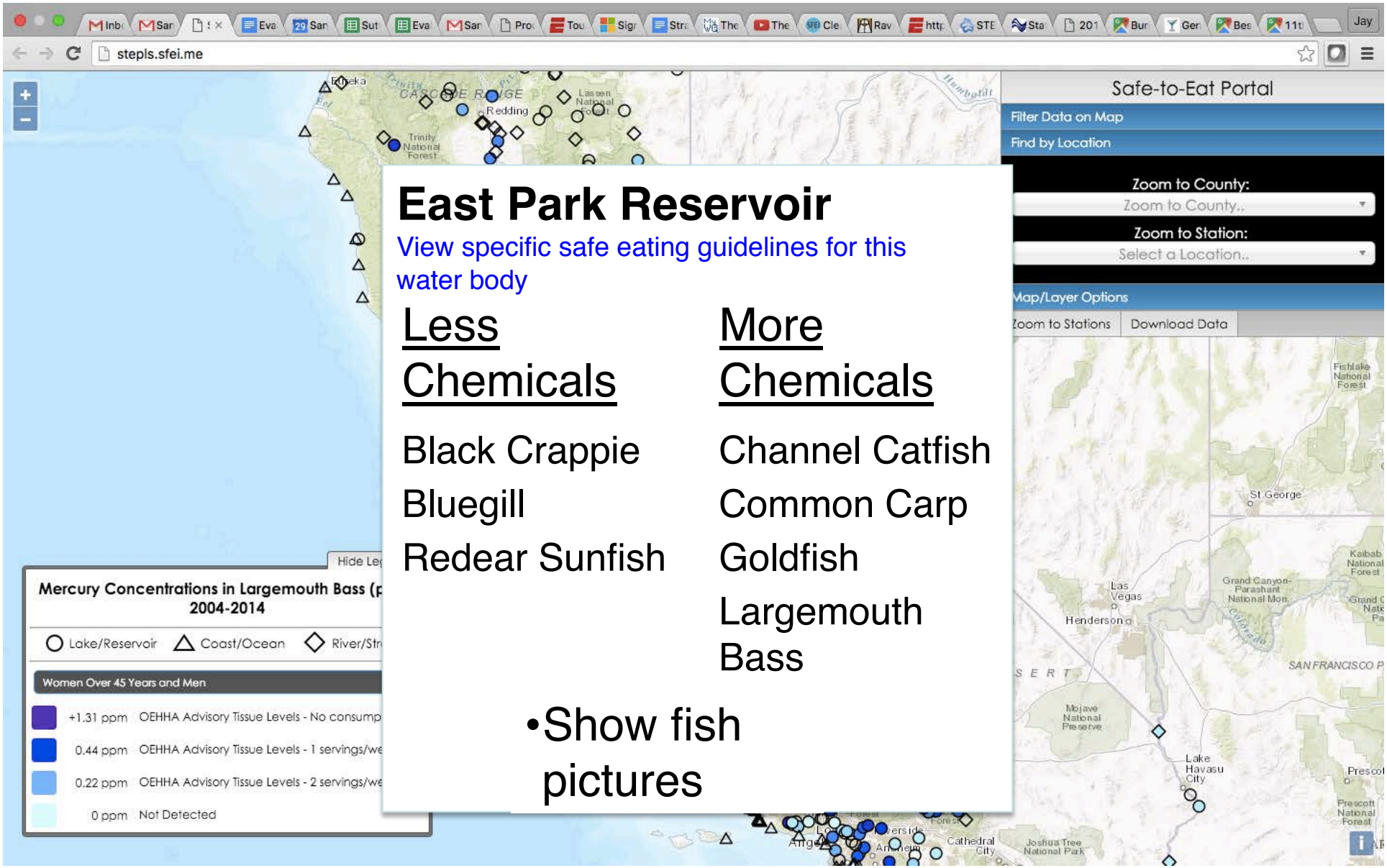
Still a work in progress…

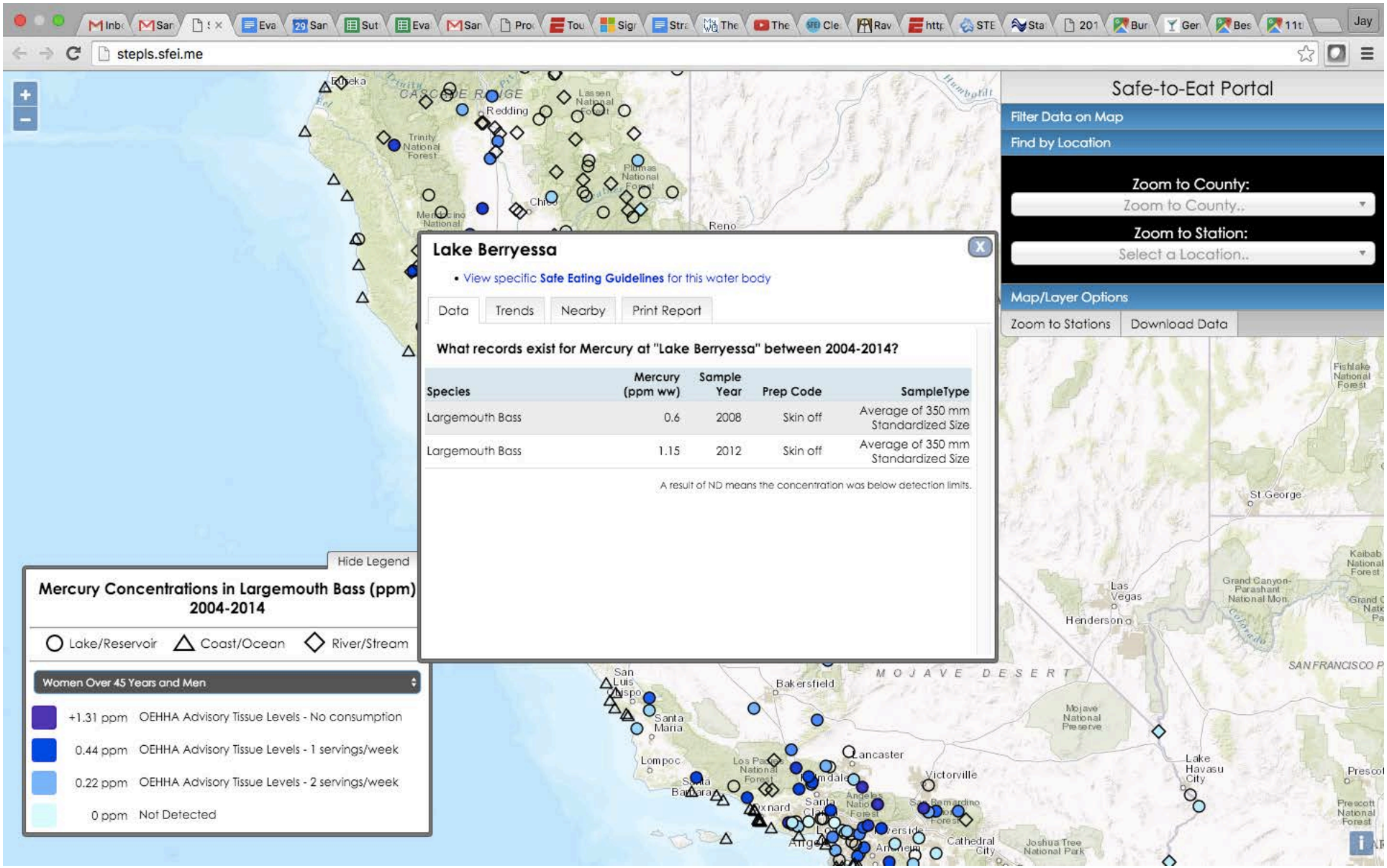
Revised Portal Opening Map – Sensitive Population



Still a work in progress…


stepls.sfei.me
Safe-to-Eat Portal
Filter Data on Map
Find by Location
Zoom to County:
Zoom to County..
Zoom to Station:
Select a Location..
Alamo River at Drop 10 Central Drain
Alamo River at Drop 6A Holtville Drain
Alamo River Outlet
Alamo River/Brawley
Almaden Lake
Alondra Park Lake
American Hatchery
American River at Discovery Park
American River at Hazel Ave and Nimbus Dam
Hide Legend
Mercury Concentrations in Largemouth Bass (ppm) 2004-2014
Lake/Reservoir
Coast/Ocean
River/Stream
Women Over 45 Years and Men
+1.31 ppm OEHHA Advisory Tissue Levels - No consumption
0.44 ppm OEHHA Advisory Tissue Levels - 1 servings/week
0.22 ppm OEHHA Advisory Tissue Levels - 2 servings/week
0 ppm Not Detected
CALIFORNIA
NEVADA
MOJAVE DESERT
SAN FRANCISCO PLATEAU
Redding
Reno
Carson City
Sacramento
Stockton
Fresno
Bakersfield
Lancaster
Victorville
Las Vegas
Henderson
Lake Havasu City
Prescott
Flagstaff


stepls.sfei.me
Safe-to-Eat Portal
Filter Data on Map
Find by Location
Zoom to County:
Zoom to County..
Zoom to Station:
Select a Location..
Map/Layer Options
Zoom to Stations
Download Data
East Park Reservoir
View specific safe eating guidelines for this water body
Less Chemicals
Black Crappie
Bluegill
Redear Sunfish
More Chemicals
Channel Catfish
Common Carp
Goldfish
Largemouth Bass
•Show fish pictures
Mercury Concentrations in Largemouth Bass (p
2004-2014
Lake/Reservoir
Coast/Ocean
Women Over 45 Years and Men
+1.31 ppm OEHHA Advisory Tissue Levels - No consump
0.44 ppm OEHHA Advisory Tissue Levels - 1 servings/we
0.22 ppm OEHHA Advisory Tissue Levels - 2 servings/we
0 ppm Not Detected
Redding
Las Vegas
Henderson
St George
Lake Havasu City
Mojave National Preserve
Cathedral City
Joshua Tree National Park


stepls.sfei.me
Safe-to-Eat Portal
Filter Data on Map
Find by Location
Zoom to County:
Zoom to County..
Zoom to Station:
Select a Location..
Map/Layer Options
Zoom to Stations
Download Data
Lake Berryessa
View specific Safe Eating Guidelines for this water body
Data
Trends
Nearby
Print Report
What records exist for Mercury at "Lake Berryessa" between 2004-2014?
Species | Mercury (ppm ww) | Sample Year | Prep Code | SampleType
Largemouth Bass | 0.6 | 2008 | Skin off | Average of 350 mm Standardized Size
Largemouth Bass | 1.15 | 2012 | Skin off | Average of 350 mm Standardized Size
A result of ND means the concentration was below detection limits.
Hide Legend
Mercury Concentrations in Largemouth Bass (ppm) 2004-2014
Lake/Reservoir
Coast/Ocean
River/Stream
Women Over 45 Years and Men
+1.31 ppm OEHHA Advisory Tissue Levels - No consumption
0.44 ppm OEHHA Advisory Tissue Levels - 1 servings/week
0.22 ppm OEHHA Advisory Tissue Levels - 2 servings/week
0 ppm Not Detected
Redding
Reno
Bakersfield
Las Vegas
Henderson
St George
Lancaster
Victorville
Lake Havasu City
MOJAVE DESERT

Item 5: 2016 Lake Monitoring Design

- Presentation and discussion today
- Written comments due April 13
- Desired outcome: Obtain input to guide preparation of the final sampling plan

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2016 Lake Sampling Plan: Overview

- Long-term sport fish monitoring plan covers 187 previously sampled bass lakes, xx trout lakes, 68 coastal locations, and xx river and stream locations
- This plan addresses:
  - Unsampled lakes
  - Lakes that have been sampled but where data gaps remain for 303(d) listing or advisory development

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Sampling Design

- Unsampled lakes
  - Follows approach employed in 2007-2008
  - Supercompositing to save money
- Lake revisits
  - Follows explicit specifications from Regional Boards or Clean Lakes design
  - Analysis of all composites (where organics analysis is requested)

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Sampling Plan: Management Questions for Unsampled Lakes

1. Should a specific lake be considered impaired and placed on the 303(d) list due to bioaccumulation of contaminants in sport fish?
   - Mercury in predator species, individual fish
   - Organics in bottom-feeder, two independent composite samples
2. Should additional sampling of bioaccumulation in sport fish (e.g., more species or larger sample size) in a lake be conducted for the purpose of developing comprehensive consumption guidelines?
   - Overall target of 9 fish per species
   - Repeated observations

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Sampling Plan: Management Questions for Addressing Data Gaps

3. Which popular lakes in California can be confirmed to have relatively low concentrations of contaminants in sport fish?
   - Clean Lakes design: data for primary indicator species

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Coordination

- Region 5 – $35K

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Lake Selection

- Stienstra fishing guide
- Regional Board information and requests

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Region	Lake	Stienstra Ratin	Bass, Trout, Both	Previously Sampled	Bass Pan	Regional Priority for 2016	Potential for Followup Based on Clean Lakes	Short List for 2016	Final List for 2016	Include PCBS	Include OC Pesticides
1	Freshwater Lagoon	7	Trout	-	-	High		X	X	X	X
1	Ewing Reservoir	4	Trout	-	-	High		X	X	X	X
1	Plaskett Lake	5	Neither (ha	2008	-	High		X	X		
2	Alpine Lake	3	Bass	-	-	3		X	X	X	X
2	Kent Lake	3	Bass	-	-	4		X	X	X	X
2	Lake Temescal	6	Bass	-	-	1		X	X	X	X
2	Stafford Lake	6	Bass	-	-	2		X	X	X	X
3	San Felipe Lake	-	Bass	-	-	High		X	X	X	X
3	Coyote Lake	-	Bass	2008	-	High		X	X		X
3	White Lake	-	Trout	-	-	High		X	X	X	X
3	Pacheco Lake	-	?	-	-	High		X	X	X	X
3	Whale Rock Reservoir	2	Trout, othe	-	-	High		X	X	X	X
3	Loch Lomond Reservoir	7	Bass	2008, 2014	2021	??	X	??	??		
5	Spaulding, Lake		Trout	2008	-	1		X	X		
5	Union Valley Reservoir		Both	2008	2021	2		X	X		
5	Fordyce Lake		Trout	-	-	3		X	X	X	X
5	Sly Creek Reservoir		Trout	-	-	4		X	X	X	X
5	Wishon Reservoir		Trout	2007	-	5		X	X		
5	Little Grass Valley Reservoir		Trout, Bullh	2008	-	6		X	X		
6	Crater Lake		Trout	2007	-	Highest		X	X		
6	South Lake		Trout	-	-	Highest		X	X	X	X
6	Lower Echo Lake - El Dorado County		Trout	-	-	Highest		X	X	X	X
6	Red Lake - Alpine County		Trout	-	-	Highest		X	X	X	X
6	Diaz Lake - Lone Pine	5	Bass	-	-	Highest		X	X	X	X
6	Hesperia Lake - Hesperia		Bass	-	-	Highest		X	X	X	X
7	Salton Sea		Tilapia	2007	-	1		X	X		
7	Finney Lake		Bass	2014	-	4	X	X	X		X
7	Squaw Lake		Bass	2014	-	2	X	X	X		
7	Senator Wash Reservoir		Bass	2007, 2014	-	??	X	??	??		
7	Taylor Lake		Bass	2014	-	3	X	X	X		
7	Wiest Lake		Bass	)04, 2007, 201	2019	??	X	??	??		
8	Big Bear Lake		Bass	)04, 2005, 200	2021	High		X	X	X	X
8	Irvine Lake		Bass	2007	2023	High		X	X	X	
8	Lee Lake		Bass	2008	-	High		X	X	X	
8	Lake Hemet		Trout	2008	2019	High		X	X		
9	Diamond Valley Lake		Bass	-	2019	High		X	X	X	X
9	Lake Murray (Murray Reservoir)		Bass	-	2023	High		X	X	X	X
9	Dixon Lake		Bass	2008, 2014	-	??	X	??	??		

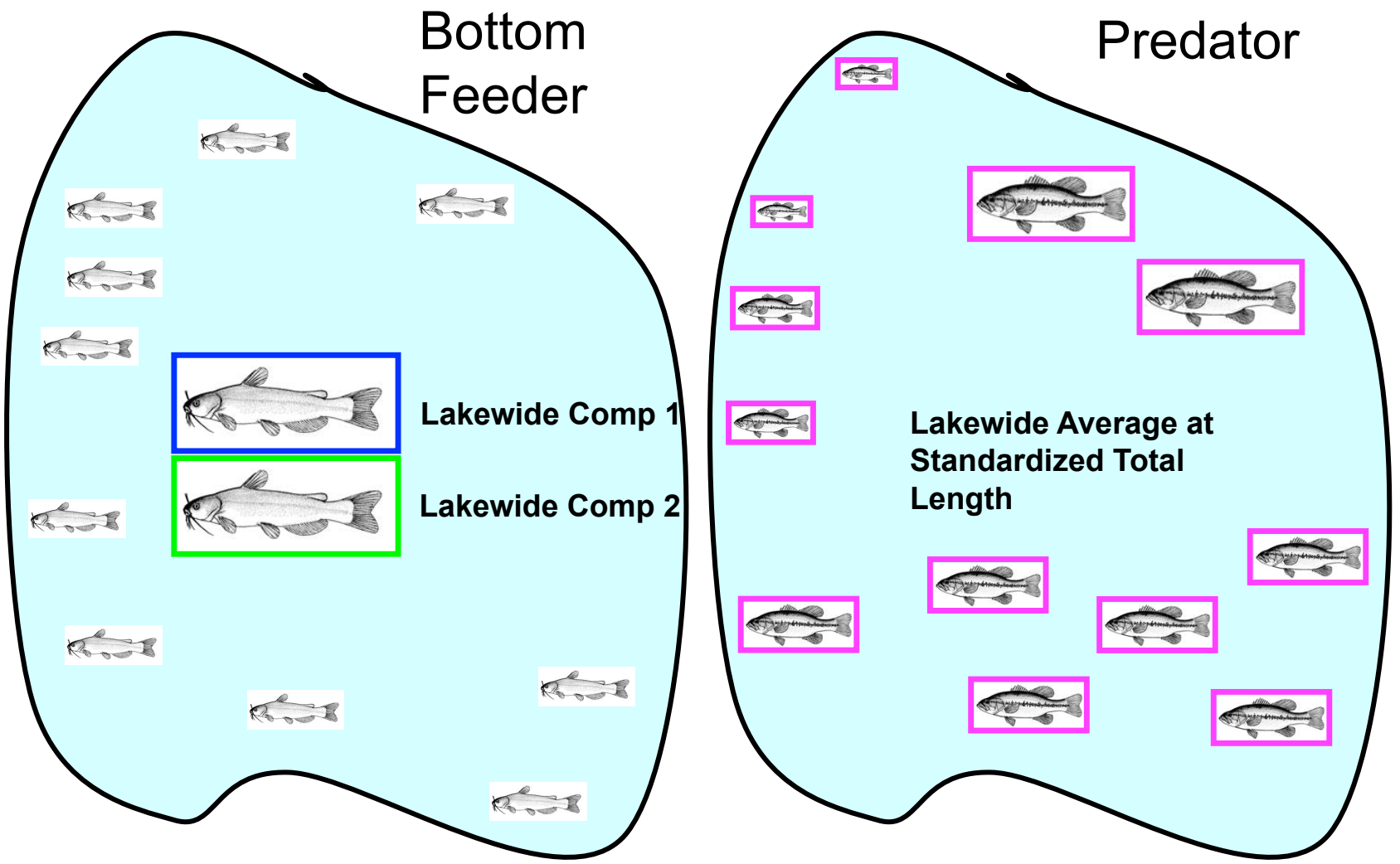
N=38

Small Lake (0 – 500 ha)
Previously Unsampled

Analyze Orgs + Hg

Analyze Hg

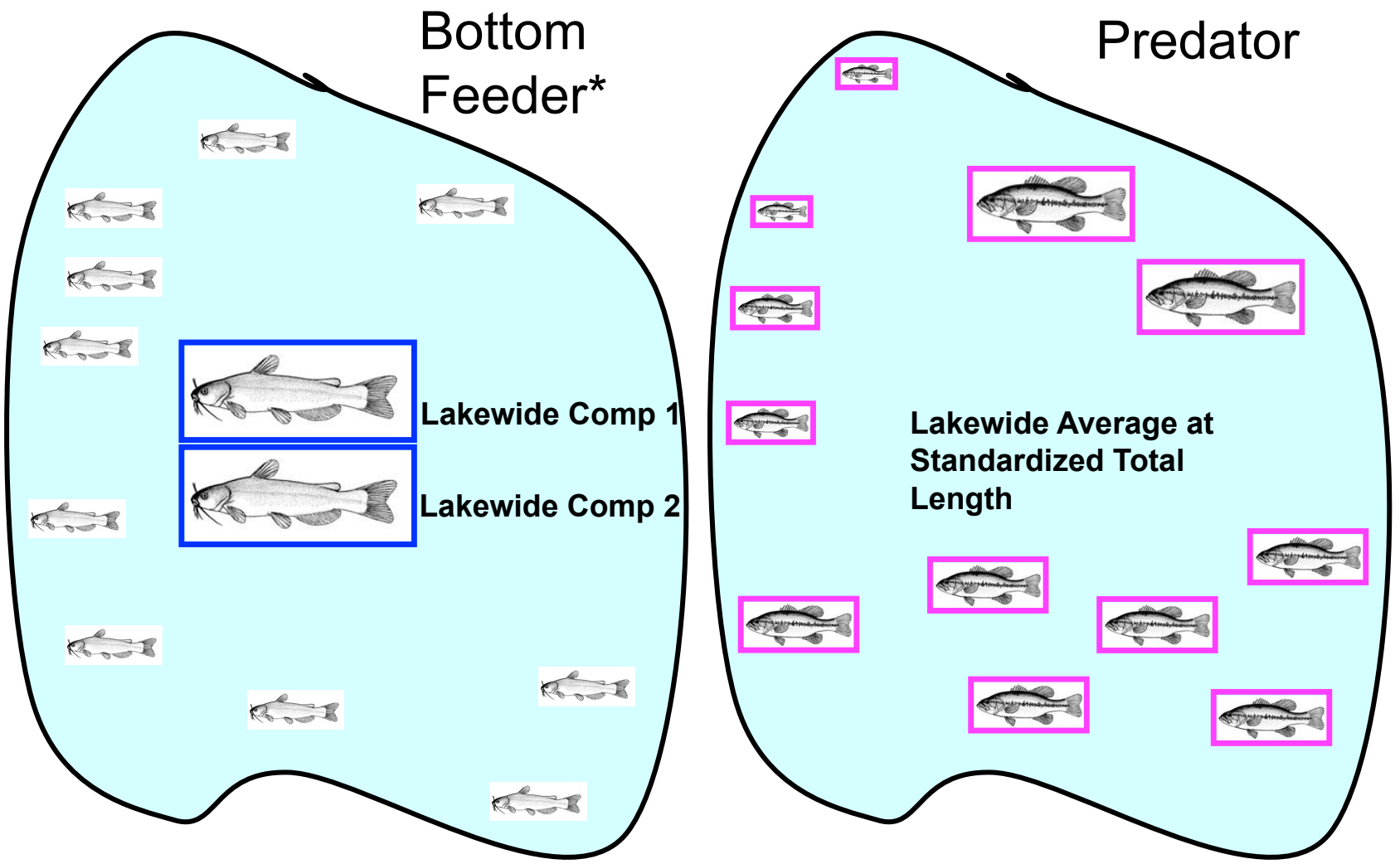
Archive Orgs + Hg



Small Lake (0 – 500 ha)
Previously Sampled

Analyze Orgs* + Hg | Analyze Hg

* Where specifically requested

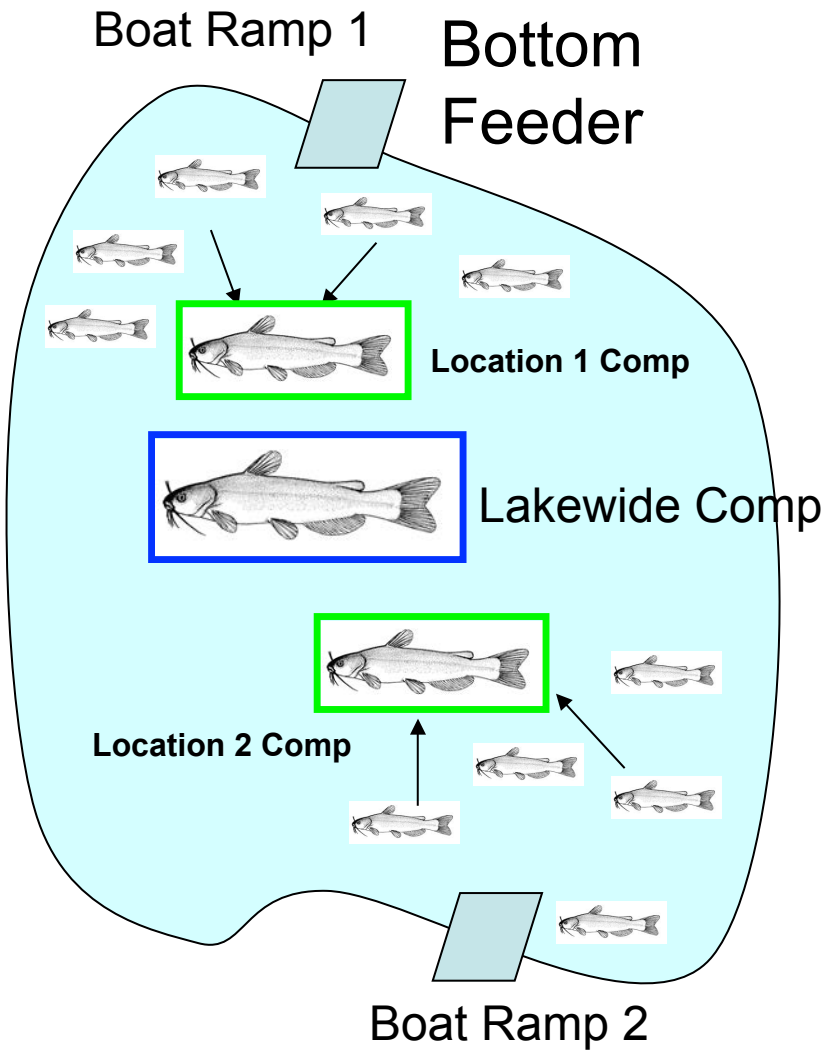


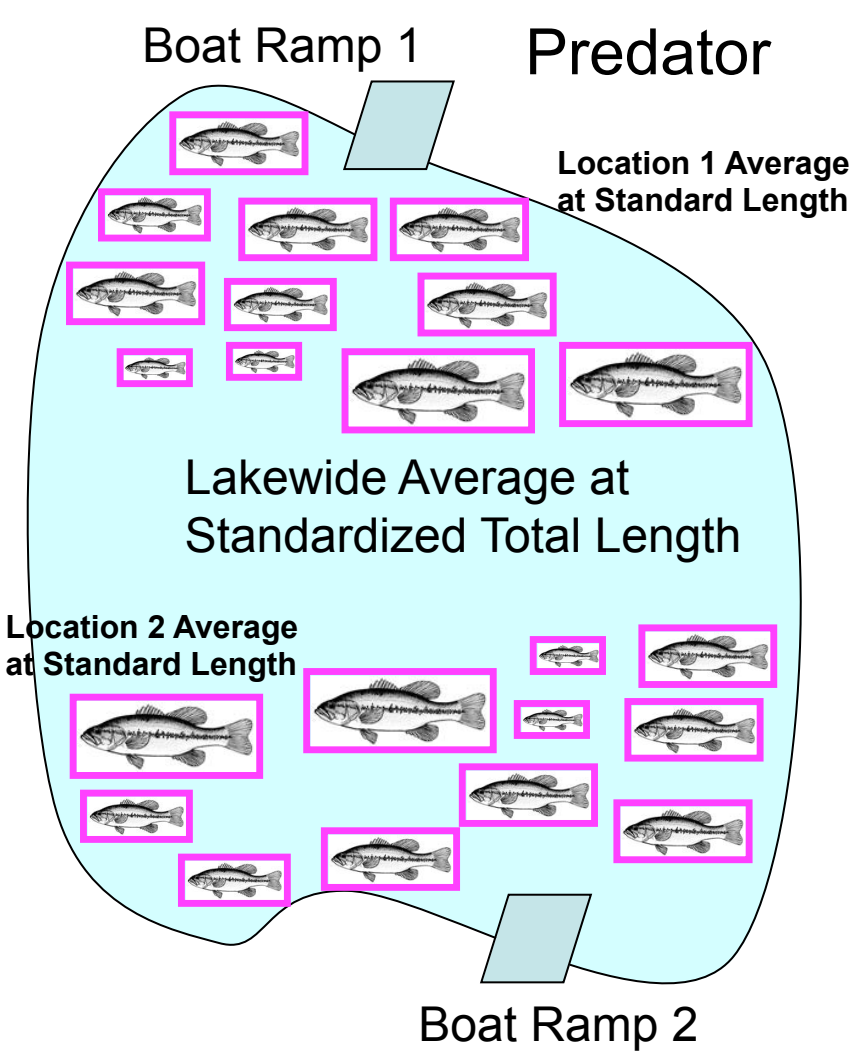
Medium Lake
(500 –1000 ha)
Previously Unsampled

Analyze Orgs + Hg

Analyze Hg

Archive Orgs + Hg



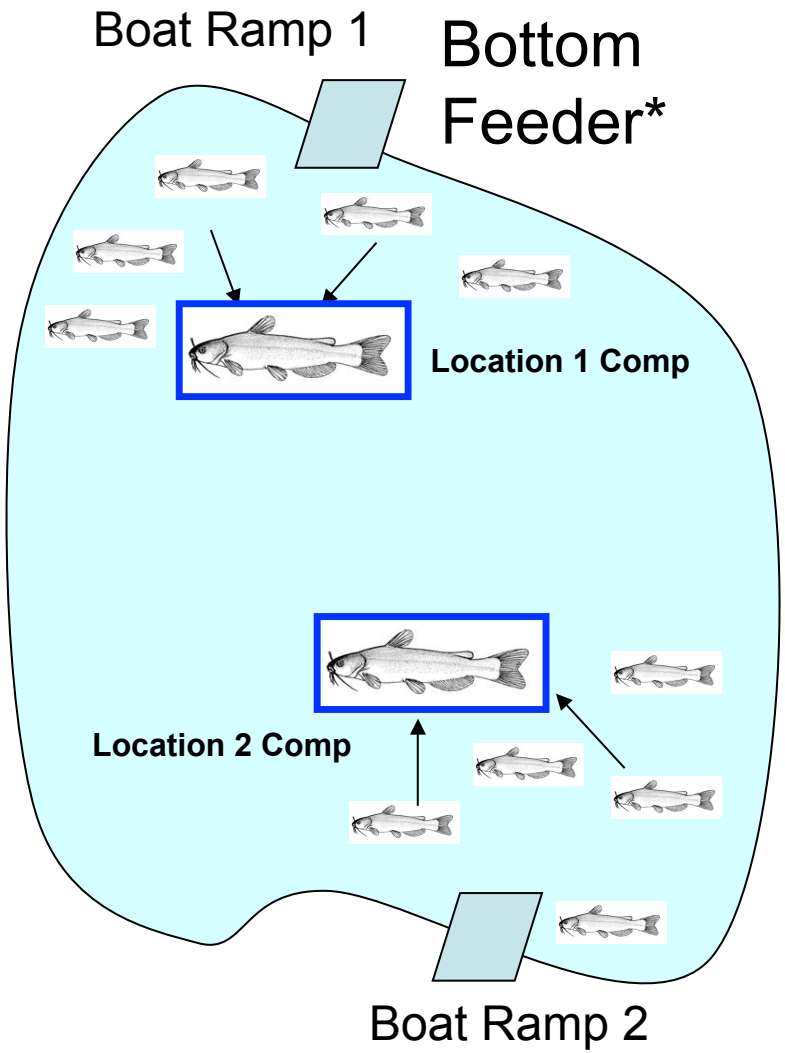


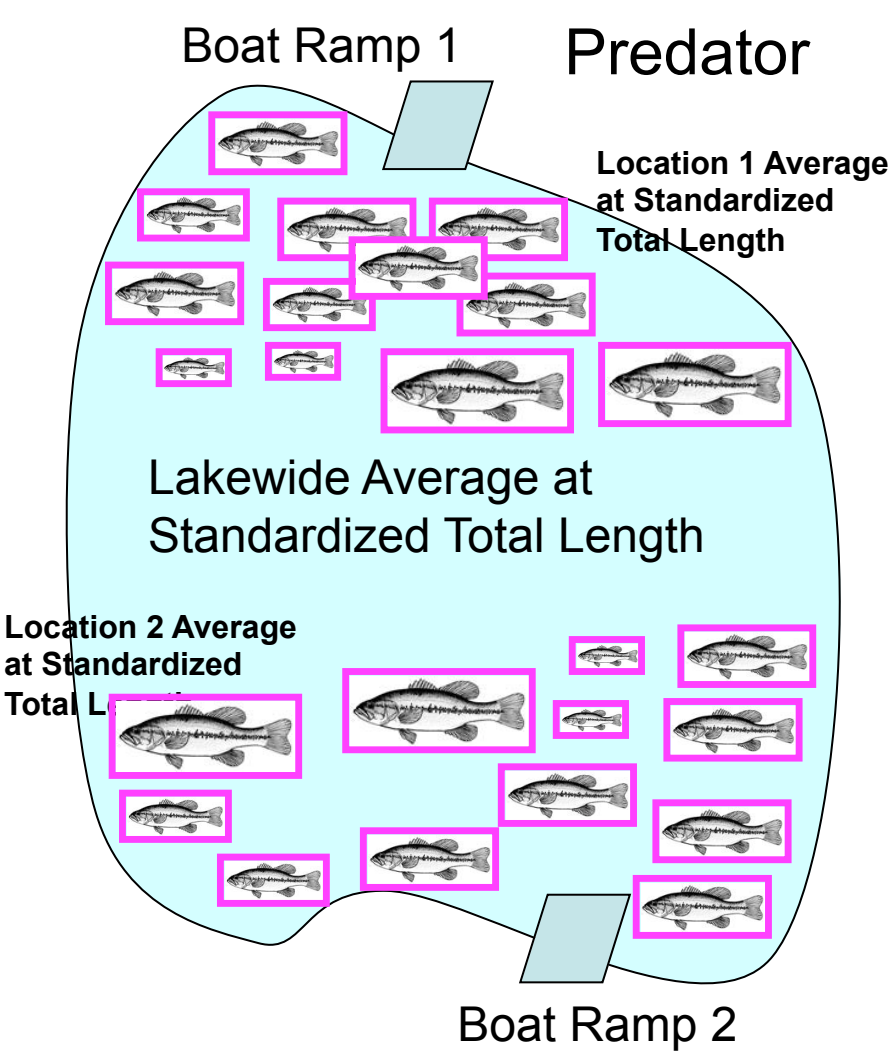
Medium Lake
(500 –1000 ha)
Previously Sampled

Analyze Orgs* + Hg

Analyze Hg

* Where specifically requested





Other Parameters

- Prey fish - yes
- Sediment - no
- Water - no

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Costs: Bass Lakes (Unsampled)

- Small Lake (1 Location), without triggered reanalysis: $11,020
- Small Lake (1 Location), with triggered re-analyses: up to $12,523
- Medium Lake (2 Locations), without triggered reanalysis: $13,414
- Medium Lake (2 Locations), with triggered re-analyses: up to $16,420
- Large Lake (3 Locations), without triggered reanalysis: $16,491
- Large Lake (3 Locations), with triggered re-analyses: up to $21,000
- Extra Large Lake (4 Locations), without triggered reanalysis: $19,568
- Extra Large Lake (4 Locations), with triggered re-analyses: up to $25,401

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Costs: Intensified Trout Lakes (Unsampled)

- Intense Trout Lake (Small), without triggered reanalysis: $12,013
- Intense Trout Lake (Small), with triggered re-analyses: up to $13,358

- Available budget for sampling and analysis: $360,000
- Enough for approximately 25 lakes

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Region	Lake	Stienstra Ratin	Bass, Trout, Both	Previously Sampled	Bass Pan	Regional Priority for 2016	Potential for Followup Based on Clean Lakes	Short List for 2016	Final List for 2016	Include PCBS	Include OC Pesticides
1	Freshwater Lagoon	7	Trout	-	-	High		X	X	X	X
1	Ewing Reservoir	4	Trout	-	-	High		X	X	X	X
1	Plaskett Lake	5	Neither (ha	2008	-	High		X	X		
2	Alpine Lake	3	Bass	-	-	3		X	X	X	X
2	Kent Lake	3	Bass	-	-	4		X	X	X	X
2	Lake Temescal	6	Bass	-	-	1		X	X	X	X
2	Stafford Lake	6	Bass	-	-	2		X	X	X	X
3	San Felipe Lake	-	Bass	-	-	High		X	X	X	X
3	Coyote Lake	-	Bass	2008	-	High		X	X		X
3	White Lake	-	Trout	-	-	High		X	X	X	X
3	Pacheco Lake	-	?	-	-	High		X	X	X	X
3	Whale Rock Reservoir	2	Trout, othe	-	-	High		X	X	X	X
3	Loch Lomond Reservoir	7	Bass	2008, 2014	2021	??	X	??	??		
5	Spaulding, Lake		Trout	2008	-	1		X	X		
5	Union Valley Reservoir		Both	2008	2021	2		X	X		
5	Fordyce Lake		Trout	-	-	3		X	X	X	X
5	Sly Creek Reservoir		Trout	-	-	4		X	X	X	X
5	Wishon Reservoir		Trout	2007	-	5		X	X		
5	Little Grass Valley Reservoir		Trout, Bullh	2008	-	6		X	X		
6	Crater Lake		Trout	2007	-	Highest		X	X		
6	South Lake		Trout	-	-	Highest		X	X	X	X
6	Lower Echo Lake - El Dorado County		Trout	-	-	Highest		X	X	X	X
6	Red Lake - Alpine County		Trout	-	-	Highest		X	X	X	X
6	Diaz Lake - Lone Pine	5	Bass	-	-	Highest		X	X	X	X
6	Hesperia Lake - Hesperia		Bass	-	-	Highest		X	X	X	X
7	Salton Sea		Tilapia	2007	-	1		X	X		
7	Finney Lake		Bass	2014	-	4	X	X	X		X
7	Squaw Lake		Bass	2014	-	2	X	X	X		
7	Senator Wash Reservoir		Bass	2007, 2014	-	??	X	??	??		
7	Taylor Lake		Bass	2014	-	3	X	X	X		
7	Wiest Lake		Bass	)04, 2007, 201	2019	??	X	??	??		
8	Big Bear Lake		Bass	)04, 2005, 200	2021	High		X	X	X	X
8	Irvine Lake		Bass	2007	2023	High		X	X	X	
8	Lee Lake		Bass	2008	-	High		X	X	X	
8	Lake Hemet		Trout	2008	2019	High		X	X		
9	Diamond Valley Lake		Bass	-	2019	High		X	X	X	X
9	Lake Murray (Murray Reservoir)		Bass	-	2023	High		X	X	X	X
9	Dixon Lake		Bass	2008, 2014	-	??	X	??	??		

N=38

Target Species

	Foraging Type		Trophic Level	Distribution			
Species	Water column	Bottom feeder		Low Eleva-tion	Foothills	High Elevation	Priority for Collection
Largemouth bass	X		4	**X**	**X**		**A**
Smallmouth bass	X		4	x	**X**		**A**
Spotted bass	X		4	x	**X**		**A**
Sacramento pikeminnow	X		4	x	x		B
White catfish		X	4	x	x		**A**
Brown bullhead		X	3	x			B
Channel catfish		X	4	**X**	**X**		**A**
Carp		X	3	**X**	**X**		**A**
Sacramento sucker		X	3	x	x		B
Tilapia		X	3				B
Bluegill	X		3	**X**	**X**		B
Green sunfish	X		3	**X**	**X**		B
Crappie	X		3/4	x	x		B
Redear sunfish	X		3	**X**	**X**		B
Rainbow trout	X		3/4	x	x	**X**	**A**
Brown trout	X		3/4		x	x	**A**
Brook trout	X		3			x	**A**
Kokanee	X		3	?	x	x	B

Trophic levels are the hierarchical strata of a food web characterized by organisms that are the same number of steps removed from the primary producers. The USEPA's 1997 Mercury Study Report to Congress used the following criteria to designate trophic levels based on an organism's feeding habits:

Trophic level 1: Phytoplankton.
Trophic level 2: Zooplankton and benthic invertebrates.
Trophic level 3: Organisms that consume zooplankton, benthic invertebrates, and TL2 organisms.
Trophic level 4: Organisms that consume trophic level 3 organisms.

X widely abundant x less widely abundant "A" primary target for collection "B" secondary target for collection

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Size Ranges and Processing

	Process for Mercury	Process for Organics and Selenium	Numbers and Size Ranges (mm)
Primary Targets: stay on location until one of these targets from both Group 1 and 2 is obtained, or collect secondary targets if primary targets are not available			
Group 1) Predator			
Black bass	I		2X(200-249), 2X(250-304), 6X(305-407), 2X(>407)
Sacramento pikeminnow	I		3X(200-300), 6X(300-400), 3X(400-500)
Group 2) Bottom feeder			
White catfish	C	C	5X(229-305)
Channel catfish	C	C	5X(375-500)
Common carp	C	C	5X(450-600)
Brown bullhead	C		5X(262-350)
Sacramento sucker	C	C	5X(375-500)
Secondary Targets: collect these if primary targets are not available			
Bluegill	C	C	5X(127-170)
Redear sunfish	C	C	5X(165-220)
Black crappie	C	C	5X(187-250)
Tilapia	C	C	5X(235-314)
Green sunfish	C	C	Xx

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Timeline: Sampling Plan

- Finalize Sampling Plan and QAPP – April 30
- Begin sampling – May

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Timeline: Products

- Draft data report – March 2018
- Final data report and fact sheet – May 2018
- Data posted to Portal – May 2018

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Sampling Plan: Discussion/Review Points

1. Is this monitoring effort a wise use of limited monitoring resources?
2. Is the sampling plan technically sound?
3. Do we have the top priority lakes?
4. Should we use supercomposites for revisits?

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Next Steps

1. Regions all provide ranked list
2. Autumn figures out the budget
3. Jay propose final list
4. Regions agree on final list
5. Finalize plan

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Item 6: Long-term Sport Fish Monitoring Plan

- Desired outcome: Obtain input on the long-term plan

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X = funded by SWAMP, O = funded by another program

General water body category	**Specific category** (numbers are approximate)	**Revisit frequency for each water body**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Lakes	**1) Bass Lakes (n=190) (Statewide Core Monitoring)**	**10 yr**	**X**		**X**		**X**		**X**		**X**		O		O		O			
	2) Other Bass Lakes - lakes not yet sampled	One-time surveys		X		X														
	3) Bass Lakes - where actions are taken	1 yr			O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
	4) Trout Lakes - <0.2 ppm (**n=90**)	20 yr												X	X	X				
	5) Trout Lakes - >0.2 ppm (n=5)	10 yr				**X**									X					
Rivers and Streams	6) Bass sites in Delta (n=10)	1 yr		O	O	O	O	O	O	O	O	O	O		O		O		O	
	7) Other bass/sucker sites (n=10)	10 yr								**X**										**X**
	8) Trout Sites - <0.2 ppm (**n=50**)	20 yr																		**X**
	9) Trout Sites - >0.2 ppm (n=10)	10 yr								**X**										**X**
Coast	10) SF Bay	5 yr					**O**					**O**					**O**			
	11) SC Bight (n=27)	10 yr					O?										O?			
	12) Other coast zones (**n=35**)	10 yr						**X**										**X**		

Long-term Plan Discussion Points

- Options for 2018
  - Revisit elevated trout lakes
  - Followup on clean lakes?
  - More lakes from the 2016 list?
  - Start on the next round of the coast?
  - Synthesis report
- General
  - Are we missing anything?

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Item 7: Information - Timeline for 2016

- Finalize sampling plan and QAPP – April/May
- Begin sampling – May
- Finalize Clean Lakes technical report – May
- Discuss and finalize public messaging of Clean Lakes results – summer
- Review and release upgraded Portal - summer

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